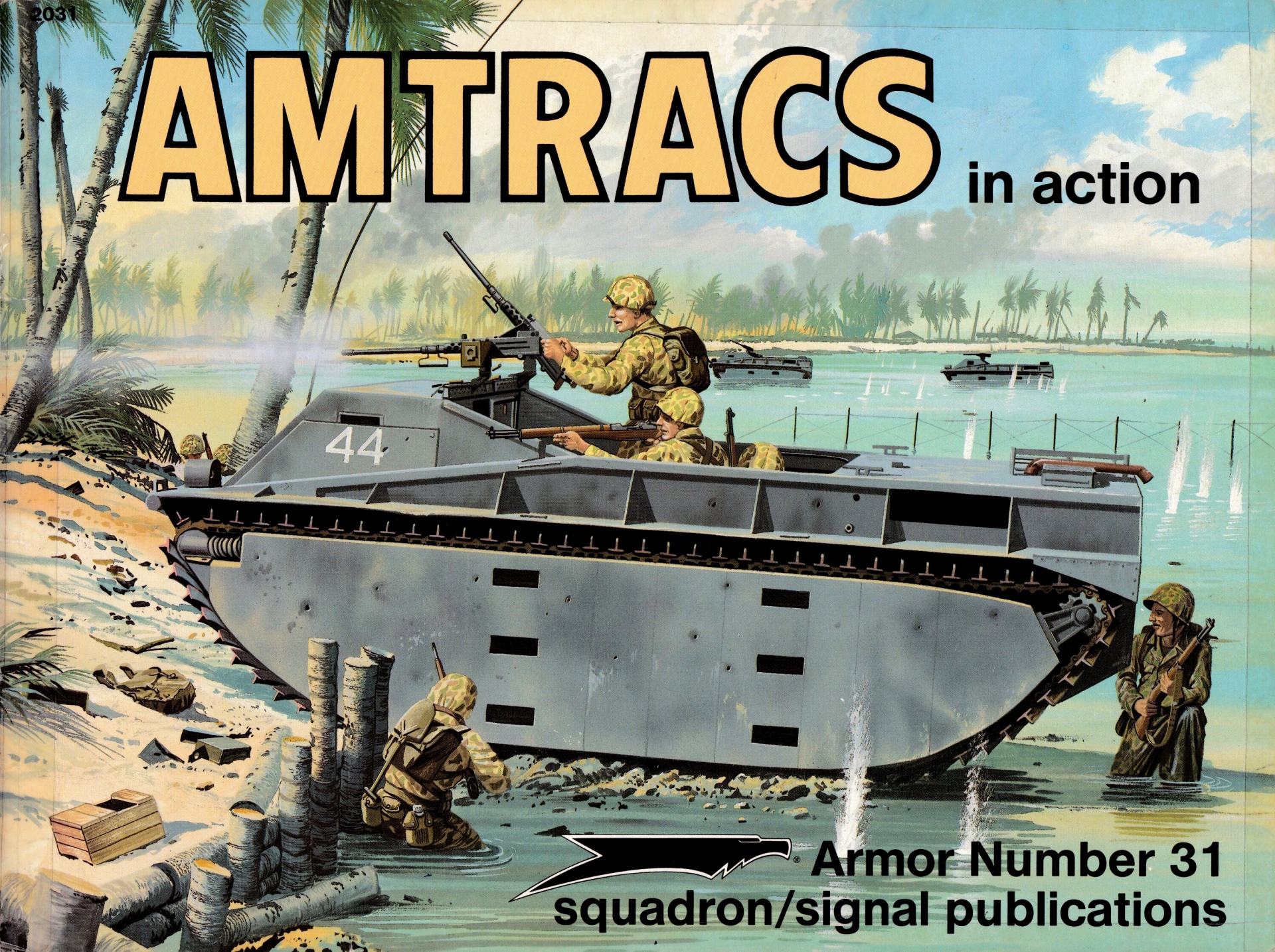
2031

AMTRACS in action



Armor Number 31

squadron/signal publications

AMTRACS in action
Part One

by Jim Mesko

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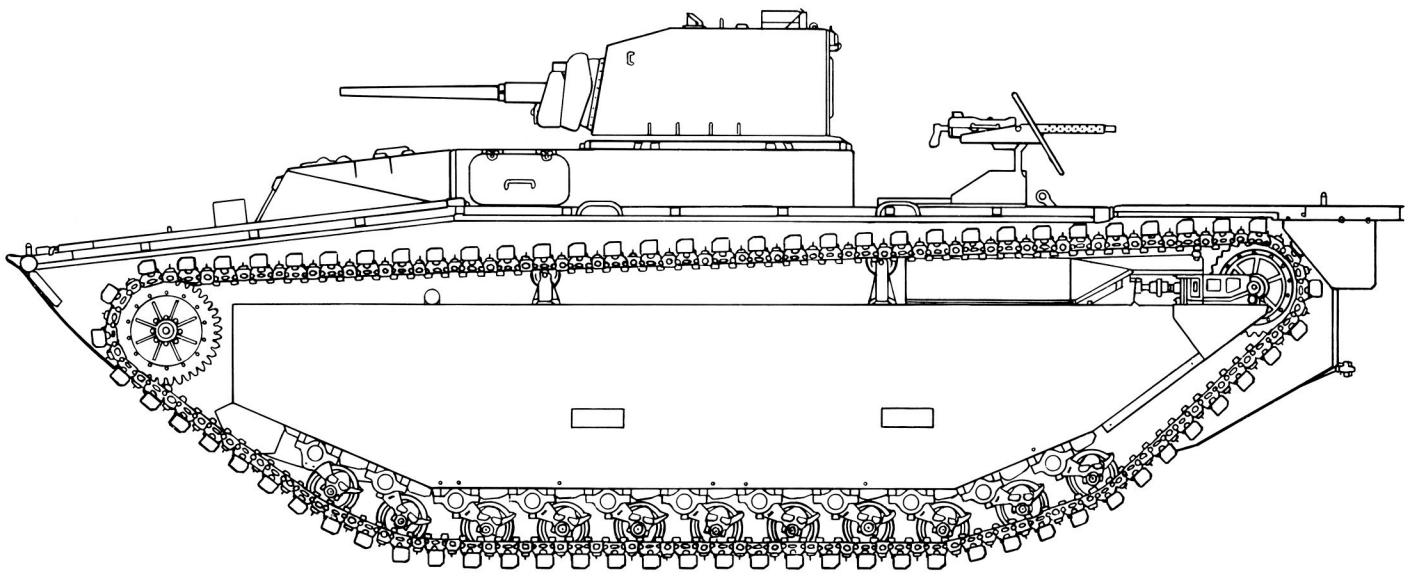
Illustrated by Joe Sewell



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An LVT-1 of the 2nd Amphibious Tractor Battalion comes ashore on Beach Red One, Betio Island, Tarawa Atoll on 20 November 1943. The vehicle has had additional armor plates attached to the front and sides of the superstructure.

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Dedication

To the "Dean of Armor Authors" Richard Hunnicutt, whose help on this and other projects is greatly appreciated. He is truly "a scholar and a gentleman." And to the Soldiers of the Sea, the United States Marine Corps who carry out the most difficult of military operations — amphibious assaults.

Photo Credits

The following people and organizations were instrumental in helping bring this publication into existence. Without their assistance it would have been impossible.

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Linda Johns

An LVT-4 loaded with Marines churns toward Okinawa on 1 April 1945. The AMTRAC has not reached the line of departure since the Marines are still riding on the sides. Once the line was reached, the men took cover in the troop compartment for protection against shrapnel and small arms fire. The ship in the background was the battleship USS TENNESSEE (BB-43) which was providing fire support for the invasion. (USN)

B111

Introduction

One of the most difficult of all military operations is an amphibious assault across a hostile beach against an entrenched enemy. During World War II, the United States Marine Corps literally raised amphibious assault procedures to an art form through the use of the Amphibious Tractor (AMTRAC) or Landing Vehicle Tracked (LVT) as it was officially known. In the words of GEN Holland ("Howling Mad") Smith, who commanded Marine forces during the invasions of Tarawa, Saipan and Iwo Jima, "Without these landing vehicles our amphibious offensive in the Pacific would have been impossible." This statement from one of the leading pioneers in the development of the Marine amphibious doctrine underlines the importance of the AMTRAC (LVT) as one of the most important weapons developed during the Second World War.

Prior to the Second World War, amphibious assaults had been, for the most part, an ad hoc type of operation with little or any specialized equipment. Normally, ships' boats were used to carry Marines, sailors or soldiers ashore. The first serious attempt at designing special boats had occurred during the Mexican War when a number of different types were constructed for the landings at Vera Cruz during 1847. Throughout the remainder of the century little was done toward developing specific vessels for amphibious operations.

During the First World War, the disastrous British reversal at Gallipoli highlighted the inherent problems with assaulting a fortified beach. After the war, however, certain key Marine Corps officers realized that any future war would probably pit the United States against Japan in the Pacific. As a result, Marine planners began to investigate ways to improve existing equipment and develop new designs. During the 1920s and 1930s, a number of different designs were studied and one of the more promising was the M1923 amphibious tank developed by Walter Christie (which was more accurately a self propelled 75MM gun). Despite some excellent performance characteristics, the Navy rejected it, feeling the design was unseaworthy. Overall, most of the money was channelled toward the development of landing craft and/or barges and, due to the lack of funds, very little was actually achieved. In the mid-1930s, a series of events took place that would eventually lead the Marine Corps toward the development of a new concept and weapons system.

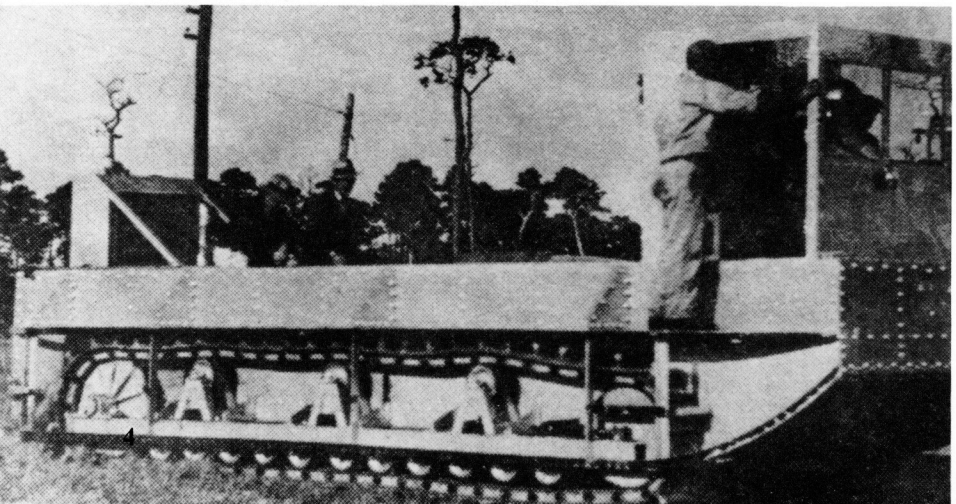
The vehicle which initially aroused Marine Crops interest was not intended for use as a tool of war, but rather as a humanitarian rescue vehicle. In 1935, following a devastating hurricane in central Florida, an engineer named John Roebling, mentioned to his son, Donald, that many lives might have been saved had a specialized vehicle existed which could have moved on both land and water. Donald, the grandson of Washington Roebling who had built the Brooklyn Bridge, began to work on such a vehicle almost immediately.

It was finished in late 1935 and emerged as a seven ton vehicle, powered by a ninety-two horse power Chrysler engine. It was twenty-four feet long and was propelled on land and water by a tank like track which had cleats bolted straight across it. While on land, a speed of twenty-five miles per hour (MPH) could be reached. In the water its speed was only a little over two mph. A novel feature of the "Alligator," as it was nicknamed, was its widespread use of aluminum in the hull to reduce its overall weight which also led to better buoyancy.

Unhappy with the low water speed, Roebling modified the original design, which was completed in the Spring of 1936. A new eighty-five horse power Ford engine was substituted for the original Chrysler power plant, overall weight was reduced by over a ton and the cleats were set diagonally across the track. Though the land speed dropped by seven miles per hour, the water speed went up to five and one-half miles per hour. This design was further modified, resulting in a slight drop in weight and a slight increase in both land and water speeds.

Still unhappy with the vehicles design and performance, Roebling decided to redo the basic design. The end result was virtually a new vehicle. Overall length was reduced by four feet while the hull was widened. Slightly over one and one half tons of weight was cut, resulting in the vehicle now weighing 8,700 pounds. In addition, Roebling redesigned the tank like track which imposed considerable drag in the water and changed

The original Roebling Alligator was designed for rescue work in the Florida swamps but proved to be a disappointment due to its slow speed in the water. Roebling, however, was not discouraged and set about designing a better version using the experience gained with this model. (Hunnicutt)



His second vehicle was far more successful with better overall speed, studier construction and was far more maneuverable in the water. There were, however, still problems with the design and further work was carried out to improve it. (FMC)

the cleats to a curved shape which were mounted diagonally. All these modifications resulted in an increase in the water speed to 8.6 mph while the land speed went up to twenty mph.

Up to this point in time, Roebling's vehicle had only been considered for use as a disaster rescue vehicle, but that was soon to change. In the 4 October 1937 issue of LIFE Magazine an article appeared entitled "Roebling's Alligator for Florida Rescue," which described the vehicle and showed photos of it in action. The article was brought to the attention of GEN Louis Rittle, Commander of the Fleet Marine Force (FMF) by ADM Edward Kalbfus at a dinner during a landing exercise conference. GEN Ross, realizing the potential of Roebling's vehicle, sent the article to the Marine Corps Commandant, who in turn, forwarded it to the Marine Corps Equipment Board with instructions to investigate the vehicle's potential. In March of 1938, MAJ John Kaluf visited Roelbing at his Florida facility in Clearwater where he filmed the vehicle in action and rode in it. Upon his return to Quantico, Kaluf wrote a favorable recommendation on the "Alligator" which was forwarded to the Commandant. This led in May of 1938, for a request to the Navy for the purchase of a pilot model to use in landing exercises to test the vehicle under operational conditions. Unfortunately, his request was denied by the Navy due primarily to a lack of funds.

The Marine Corps, however, was not dissuaded by this lack of Navy support and continued to pursue development of the vehicle. During 1939, a number of high ranking Marine officers visited Clearwater to witness the Alligator in action and confer with Roebling. GEN E. P. Moses, who had been at the conference when the LIFE article was brought up, finally convinced Roebling that his vehicle could be of value to the military and he agreed to design an "Alligator" for military use.

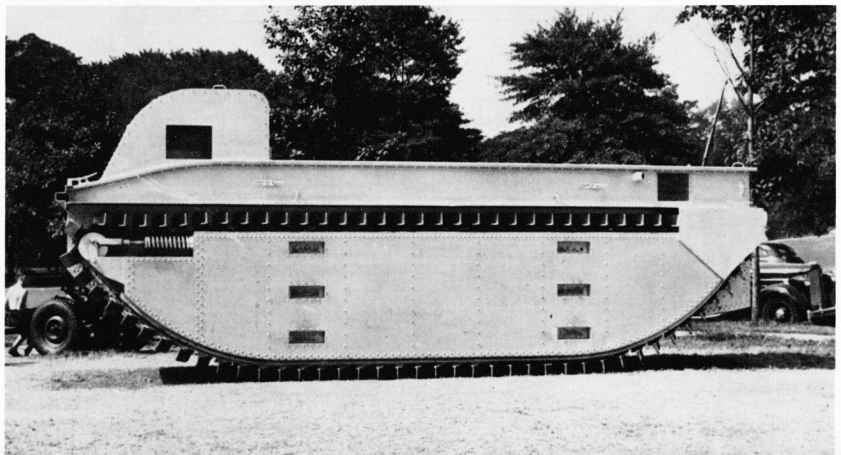
This new design, sometimes referred to as the "Crocodile," was completed during May of 1940. This new vehicle was similar in size and performance to the one in the LIFE article but was powered by a ninety-five horse power Mercury engine. After viewing this new design, the Marine Corps felt it had great potential and again requested funding for the project from the Navy. With the war going on in Europe, money was more readily available for new projects and the Navy agreed to the Marines' request. Roebling was contacted by Navy officials to build a second prototype with a more powerful 120 horse power Lincoln-Zephyr engine. This new vehicle, after being inspected in August of 1940 by Marine and Navy officers, was judged to be satisfactory and Roebling was given the go-ahead to produce it.

Completed in mid-October, it was sent to Quantico in early November taking part in Fleet Landing Exercises in January and February of 1941. Although the results were impressive, the Navy indicated that certain changes were needed. The main concern was with the aluminum construction which Navy and Marine officials felt would not stand up to hard use in the field. In addition, aluminum was still relatively new in terms of being used for this type of construction and techniques for tooling and fabrication were still in their infancy, causing further reluctance for its use by the military. They also felt that the tracks would not be able to withstand the constant abrasion of sand and sea water.

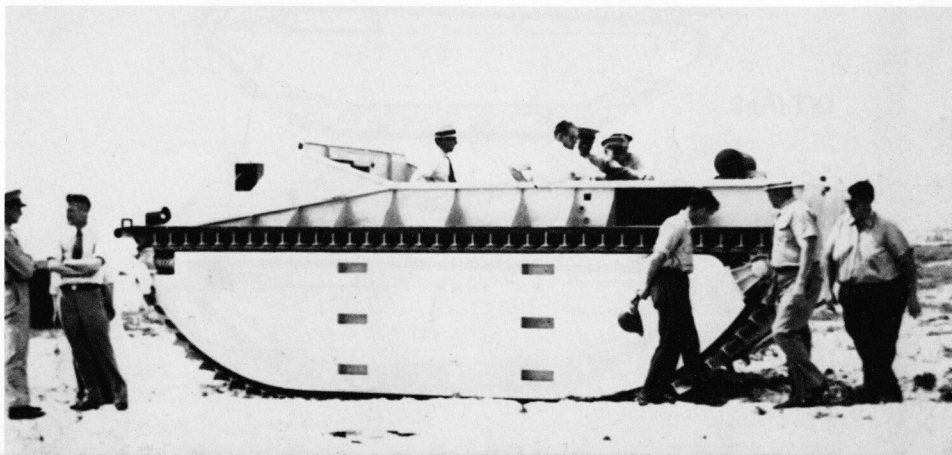
With these changes in mind, the Navy contracted with Roebling for 100 Landing Vehicle Tracked (LVT) of all steel construction. Roebling, however, did not have the facilities to meet such an order and turned to the Food Machinery Corporation (FMC) which had earlier fabricated some parts for his original vehicles. In conjunction with James Hoit, Chief Engineer, an all steel vehicle of riveted construction was designed.

Following this, two prototypes were built at FMC's Riverside Plant which received official approval after being examined by military officers. The Navy then awarded FMC a contract for an additional 200 vehicles, designated LVT-1 or, as it was more commonly known, the "Alligator," with the first production model coming off the assembly line during July of 1941 (the Roebling "Alligator 3" was donated by his widow in the mid-1960s to the Marine Corps and stored at the 4th Assault Amphibious Battalion in Tampa. In late 1987, it was shipped to the USMC Quantico Museum for renovation and exhibition).

The final version did away with the earlier suspension system to lessen drag in the water. The overall dimensions were also reduced and speed and maneuverability in the water were increased. The vehicle was the subject of an article in "LIFE" magazine which was brought to the attention of the U.S. Marines by a Navy Admiral, which led to the examination of the "Alligator" by Navy and Marine officers. (FMC)

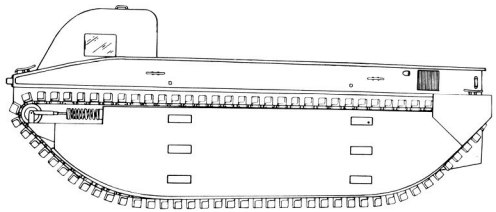


The worsening situation worldwide led the military to begin modernizing its forces and the Marines were able to get funding for this new amphibious vehicle. Roebling did some redesign of the basic vehicle after receiving a list of changes wanted by the Navy, which led to a contract for 100 Landing Vehicle Tracked (LVTs) also known as AMTRACs (Amphibious Tractors). (FMC)

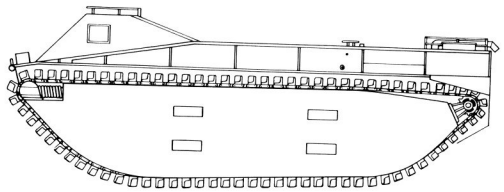


Development

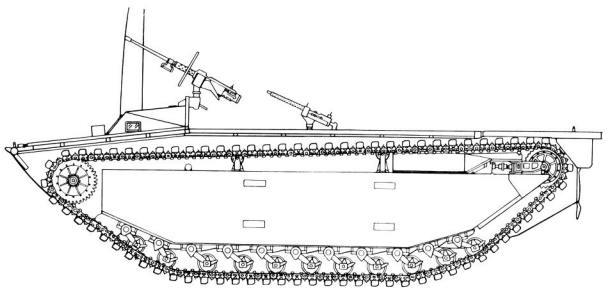
Alligator



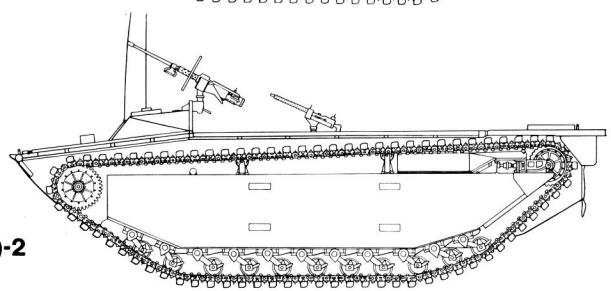
LVT-1



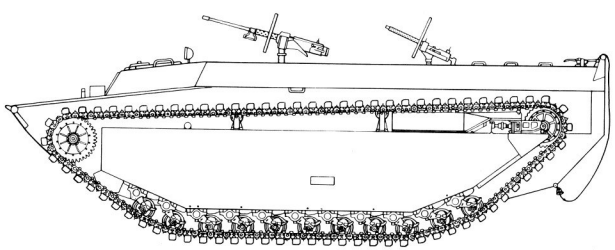
LVT-2



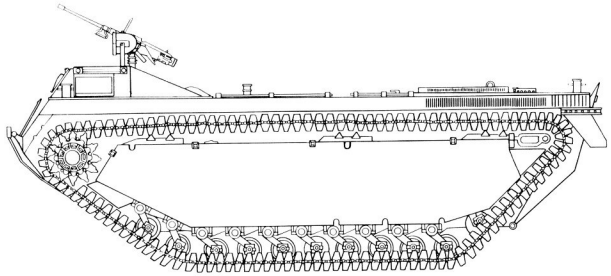
LVT (A)-2



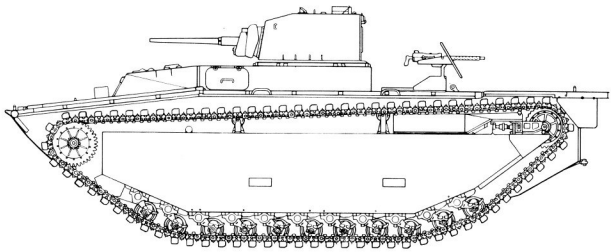
LVT-4



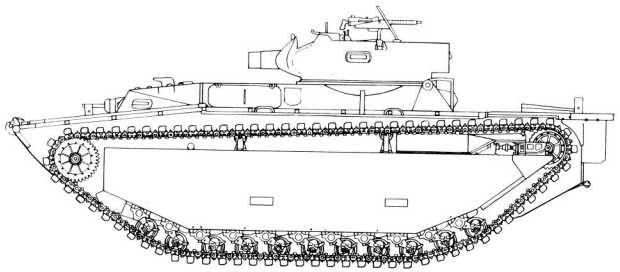
LVT-3



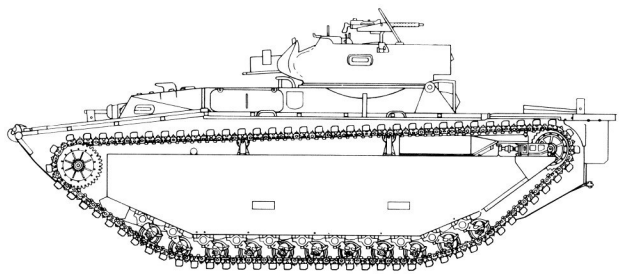
LVT (A)-1



LVT (A)-4



LVT (A)-5



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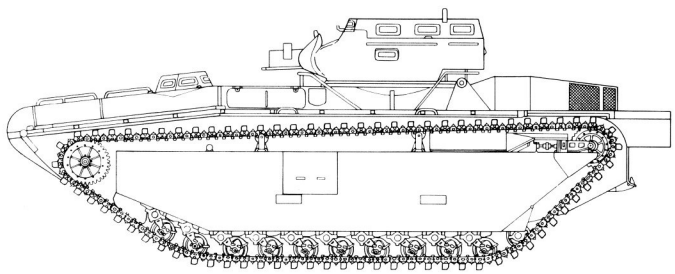


LVT-1

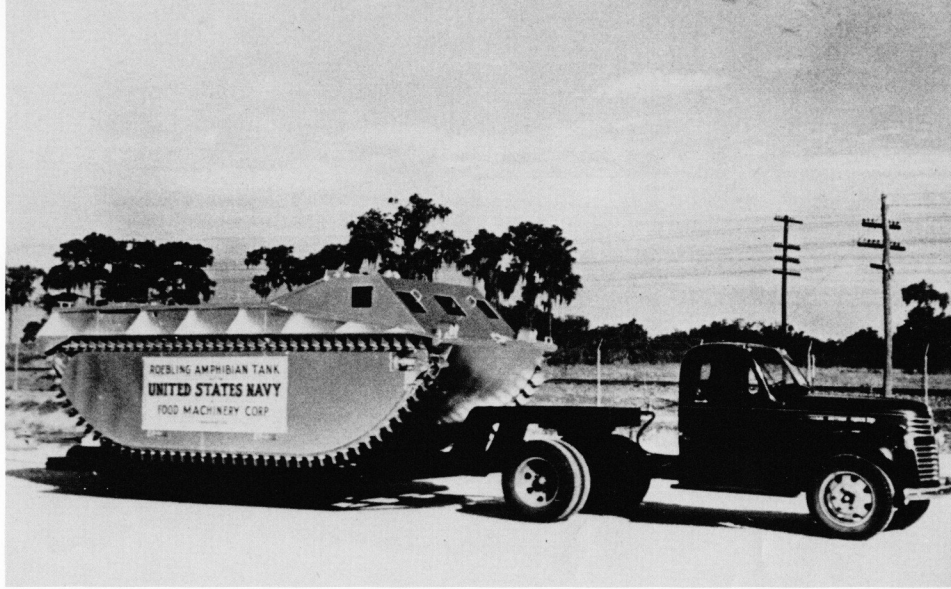
The LVT-1s, which began emerging from the FMC production line in the Summer of 1941, were unlike any military vehicle then in American or foreign service. The box like hull was twenty-one feet long, nine feet ten inches wide and seven feet eight inches high. The hull was divided into three compartments. In the forward portion was the driver's cab with a slanted front plate which had three windows for crew visibility. An additional window was located on either side of the cab on vertical plates which gave the crew a fairly good field of vision. Directly behind the cab was the cargo compartment which could carry twenty fully equipped troops or 4,500 pounds of cargo. In the rear was the engine compartment which contained a 150 horse power Hercules engine. Fuel tanks were situated on either side with a total capacity of eighty gallons which allowed for a range of seventy-five miles on land or fifty miles in water.

Along each side of the LVT-1 were sponsons and the track mechanism. The rear drive sprockets were rigidly attached to the hull while track tension was maintained by an idler block in the upper forward corner of the sponson. Along the rigid suspension ran tracks which had the rollers built into them. They rode on steel channels which served as guides throughout the entire distance around the sponsons except at the sprockets and idler block. The tracks had grousers or cleats mounted diagonally which propelled the LVT-1 on land or water. Steering was accomplished by changing or reversing the speed of either track. The vehicle could reverse itself completely in its own length by reversing one track, then running both at full speed.

Initially, the LVT-1 carried no armor and was constructed of various gauges of mild steel sheet. Armament consisted of one .30 caliber and one .50 caliber machine gun mounted on track rails. Later, additional guns were added based on the crew's preference and battle experience. At the time it was first introduced, the LVT-1 or "Alligator" was not intended for the assault role but rather as an amphibious supply vehicle, so it was felt that armor protection was not needed.

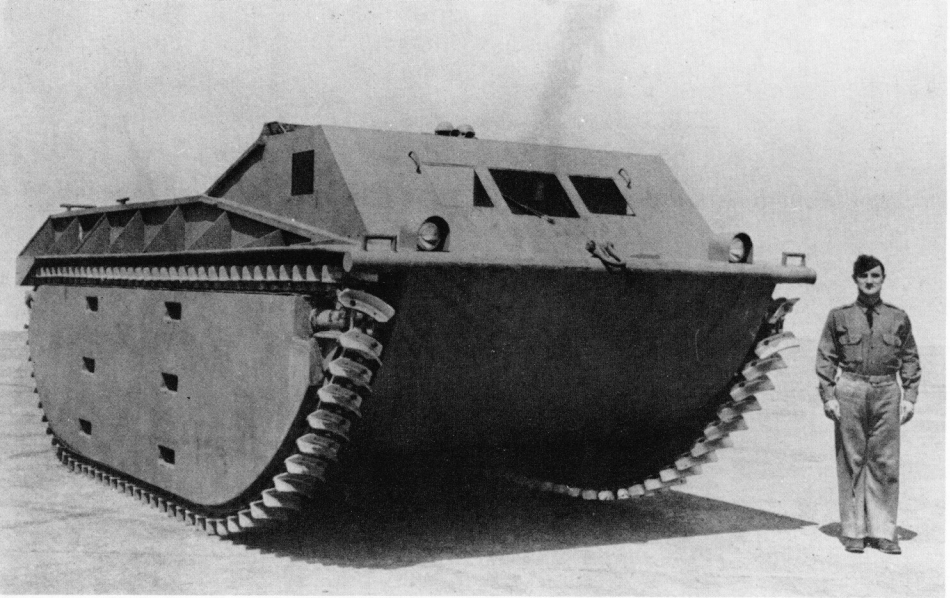
Once initial construction had started and vehicles began to roll off the production line, the Navy and Marine Corps realized the initial contract of 200 LVT-1s would not be anywhere near enough. Subsequently, the number of "Alligators" on order was increased to meet demands, resulting in an eventual production run of 1,225 vehicles. Of these 540 were procured by the Marine Corps, 485 by the Army and the remainder were given to Allied forces.

Though the potential of the new vehicle was evident, even at this early stage, certain problems were obvious. Track wear due to the unique design created a situation where sand and salt water caused excessive abrasion. While the LVT-1 was designed for use on land or water, in reality its use on land was severely limited due to excessive damage caused to the tracks when used over rough ground. Additionally, the life expectancy of the LVT-1 was only a few hundred hours because of stress and wear on the tracks, engine and suspension. As a result, plans were made for newer and more capable vehicles to supersede the LVT-1.

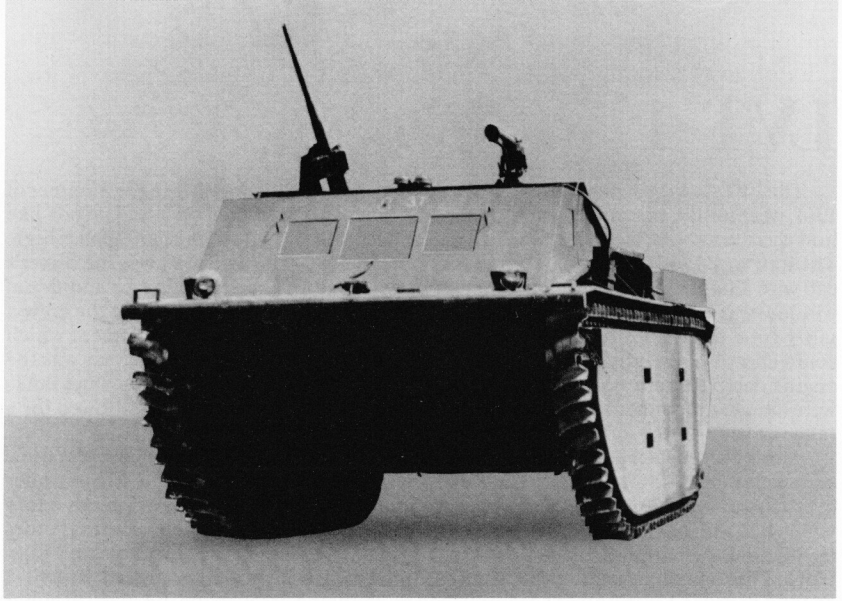


The first LVT-1 was rolled out in the summer of 1941 at Lakeland, Florida. Since Roebling did not have the facilities to produce the vehicles in large numbers, he contracted with the Food Machinery Corporation (FMC) to help manufacture AMTRACs. The sign on the side of this LVT is inaccurate since the LVT-1 was not an amphibious tank but an unarmored troop/cargo carrier. (FMC)

The production LVT-1 differed from the prototype in that steel was used in place of aluminum since it was felt the aluminum would not hold up under actual use in forward areas. The use of steel caused a rise in weight and a corresponding decrease in land speed. The rear drive sprockets were non-adjustable and any slack in the track was taken up by the idler block located in the front of the vehicle. (FMC)



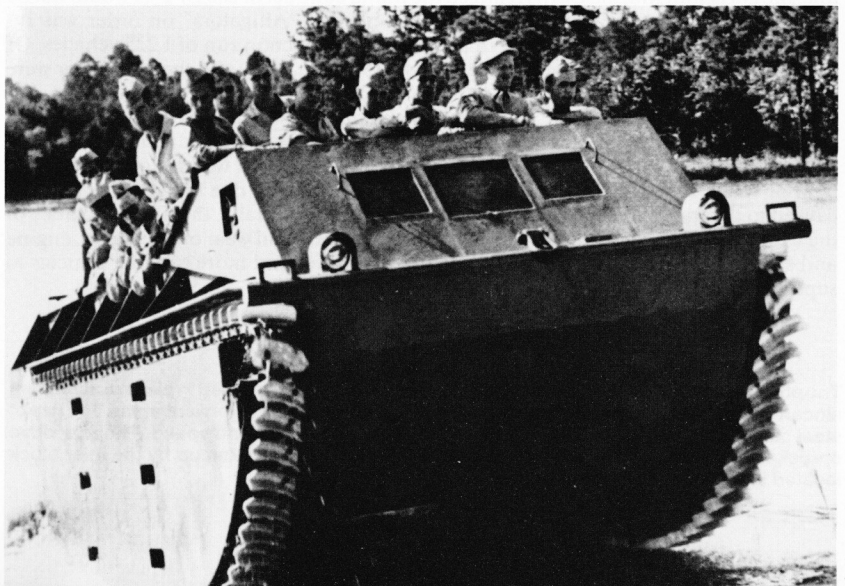
Eventually, 1,225 LVT-1s were manufactured, with production ceasing in 1943. Early models, such as the one in the roll-out ceremony, had widely spaced windows but later production variants such as this had the windows more closely together. (Hunnicutt)



While the LVT-1 was designed basically as a supply vehicle, it could carry a variety of armament such as .30 caliber and .50 caliber machine guns. No armor was fitted to the LVT-1, but later some were armored in the field when enemy opposition was expected during amphibious assaults. The LVT-1 could be fitted with up to four .30 caliber machine guns. (FMC)

The grousers allowed the LVT to move through the water at speeds of between six and seven miles per hour in relatively calm water. The vehicle could go through various types of swampy conditions which would bog down conventional wheeled or tracked vehicles. (National Archives)

This late production AMTRAC emerges from the water loaded with Marines during vehicle testing in Florida, revealing the curved grousers which propelled the LVT-1 through the water. The grousers (or cleats) were attached diagonally directly to the tracks. (National Archives)



LVT-2

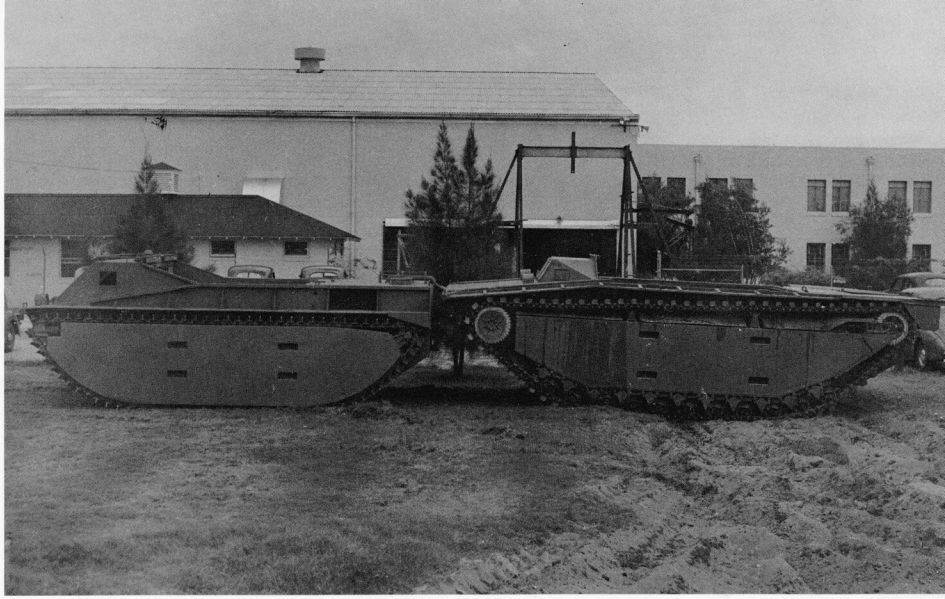
While the LVT-1 proved to be a creditable military vehicle, its inherent shortcomings made it necessary to look for ways to improve the basic design. The main problem was with the track and suspension system which had a short life expectancy due to excessive wear. This had been noted by both FMC and the military, along with the Borg-Warner Company which the Navy had asked to evaluate the LVT. All parties concerned agreed that the only way to solve the problem was to completely redesign these components. Work on this redesign began in the summer of 1941 by FMC, in conjunction with the Navy's Bureau of Ships. Completed in December of 1941, this new design was then built as a prototype and subjected to an extensive series of evaluations.

The new vehicle, designated the LVT-2 "Water Buffalo," featured a number of significant changes. The major one dealt with the suspension and track. The older rigid suspension was replaced by a torsion spring type which had eleven bogies mounted on each side of the hull at the bottom of the sponsons. Unlike the original tracks, the new ones had hermetically sealed bearings to prevent excessive abrasion and extra high track guides to help keep them from being thrown during turns or operation over rough terrain. A new "W" shaped grouser replaced the original cleat, which had been found to cause lateral pressure and wear when in the water.

The shape was decided on after an extensive series of tests on models during which over 100 different shapes were tried before the final shape was decided on. To help prolong life expectancy, FMC used the tried and proven power train of the M3A1 light tank which provided greater power and was more reliable than the one used in the LVT-1. The front unit drive of the new vehicle allowed the tracks to discharge mud, sand, rocks and other debris before they got to the drive sprockets. Power from the engine was transferred to the front drive sprocket via a drive shaft which ran above the floor of the cargo bay, using flexible couplings to lessen damage to the drive shaft without loss of power.

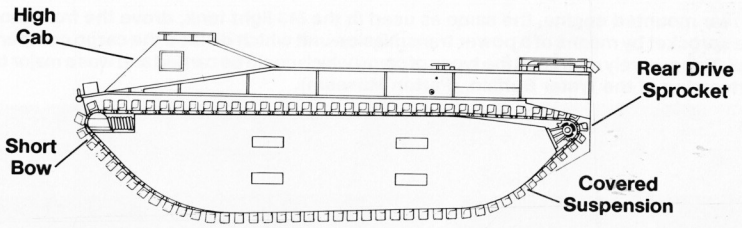
The LVT-2 differed substantially in dimensions and appearance from the LVT-1. The new AMTRAC was nearly five feet longer and one foot wider, while overall height remained nearly the same. Powered by a Continental air cooled seven cylinder 200 horse power radial engine, the LVT-2 had a top land speed of twenty-five mph and a water speed of six mph. It was capable of carrying 6,500 pounds of equipment, an increase of one ton over the LVT-1 and could carry twenty-four troops (an increase of four). Land range was doubled over the LVT-1, while water endurance was increased by fifty percent. Aside from the new suspension, the general outline of the LVT-2 was also more streamlined than the LVT-1 which had presented an almost boxlike appearance. The LVT-2 had a more pointed bow, the cabin was lowered and all vertical surfaces on the sides were angled in for better protection. Forward visibility was through two large windows on the front and one on either side. Provisions were made for mounting one .50 caliber and one .30 caliber machine gun on rails behind the cabin and around the back half of the cargo area, although it was not uncommon for crews to add others for increased firepower.

Production of the LVT-2 began during early 1943 and ended toward the latter part of 1944, with 2,962 being produced. Only a small portion of these (100) were given to the Allies, the remainder going to the Marine Corps (1,355) and the Army (1,507). Late in the production run in March of 1944, it was decided to fit armor to the cabs in order to provide the crew with a certain degree of protection. Prior to that, armor kits were provided which were welded on AMTRACs used in the assault waves to provide additional protection. None of these ever received a change in designation due to the addition of armor.

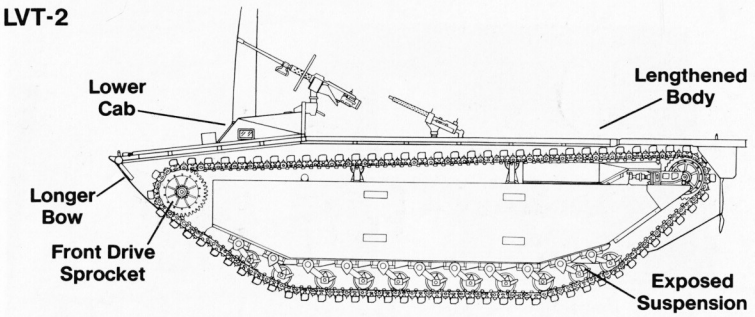


Problems with the LVT-1 led to a complete redesign and development of a new vehicle to replace it, the LVT-2. The two vehicles differed in overall shape, size, track and drive train. The boxy shape of the LVT-1 (left) was replaced by a more streamlined design in the LVT-2 (right). Additionally, there were numerous internal changes between the two vehicles. (FMC)

LVT-1

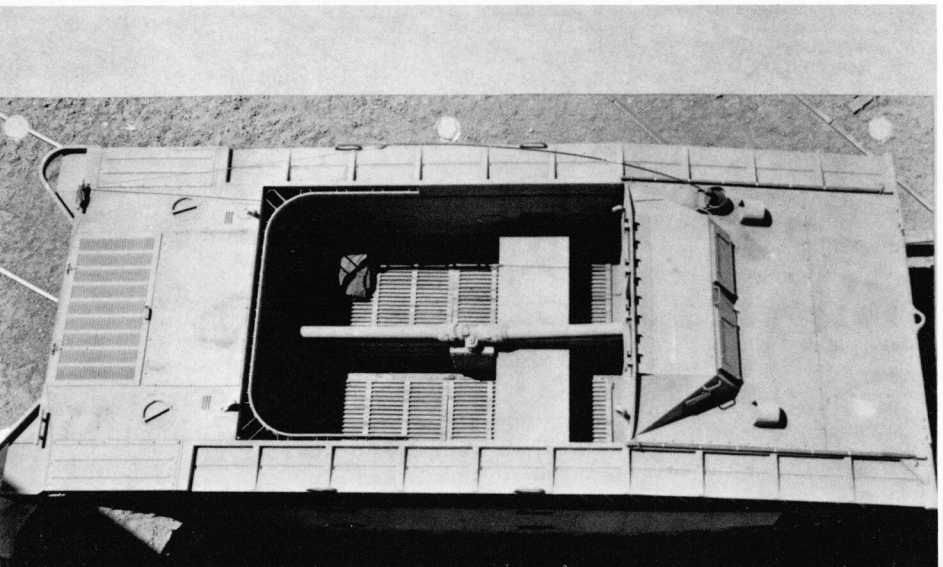


LVT-2

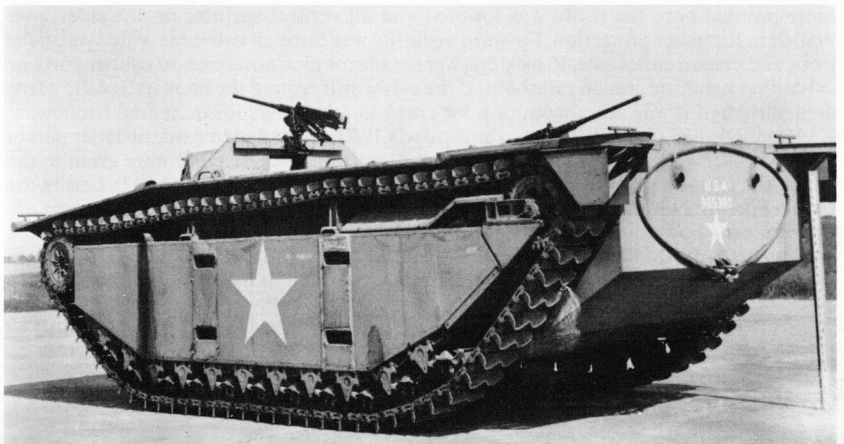


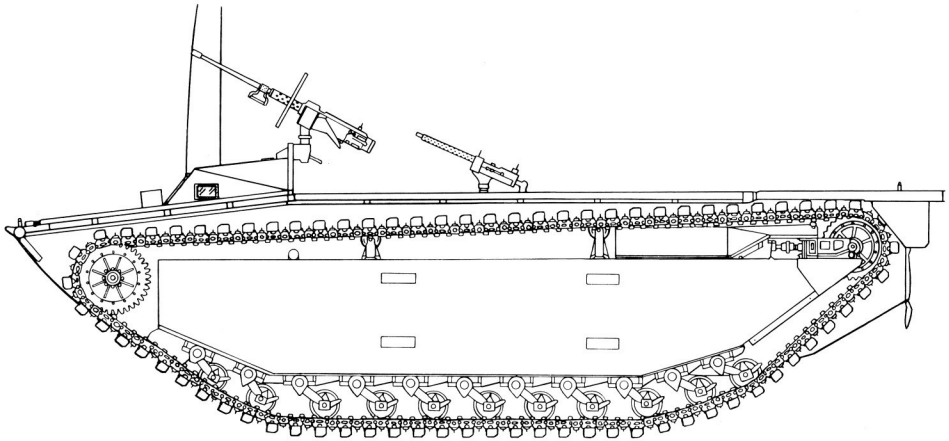
One of the major changes between the LVT-1 and LVT-2 was the torsional type suspension which replaced the rigid type found in the LVT-1. The new track was designed to cut down on wear caused by sand by having hermatically sealed bearings. Additionally, the grousers were reworked into a "W" pattern after extensive testing to determine the best possible shape. (FMC)

The rear mounted engine, the same as used in the M3 light tank, drove the front mounted drive sprocket by means of a power transmission unit which divided the cargo compartment in half. This severely restricted the types of cargo which could be carried and was a major tactical shortcoming of the Water Buffalo. (Patton Museum)



Another major shortcoming which the LVT-2 had (along with the LVT-1) was that all troop and cargo movement had to be over the sides since there was no direct access to the vehicle from ground level. This forced troops to disembark over the sides which exposed the men to enemy fire. (Patton Museum)





Specifications

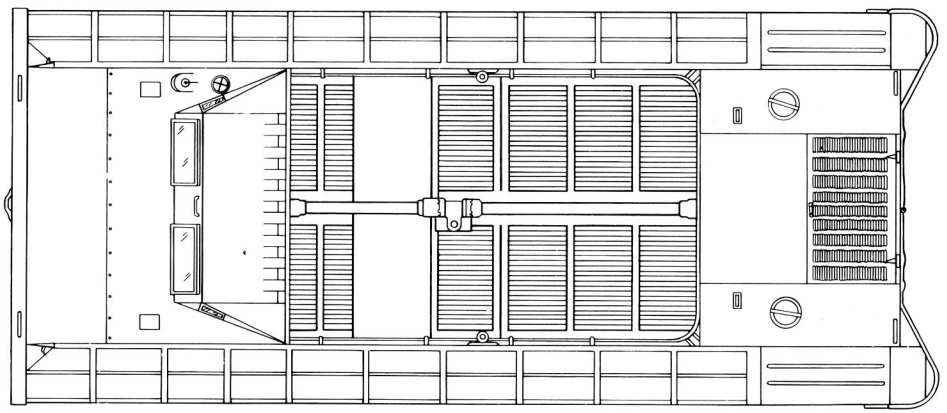
LVT-2 Water Buffalo

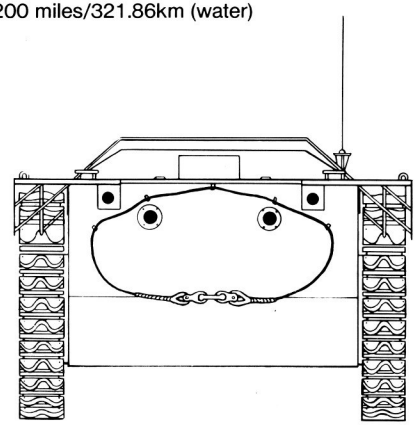
Crew .....Two-three

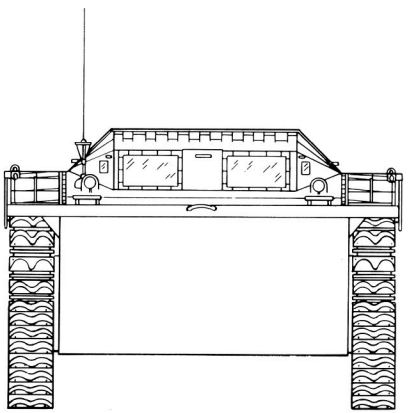
Length .....26 feet 2 inches (7.97m)
Width .....10 feet 8 inches (3.25m)
Height .....8 feet 8.5 inches (2.64m)
Weight .....30,250 pounds (13,721 kg)

Armament
Main .....50 and .30 caliber machine guns

Engine .....One 250 hp Continental engine
Speed .....20 mph/32.18 kmh (land)
7.5 mph/12.06 kmh (water)
Range .....300 miles/482.79km (land)
200 miles/321.86km (water)





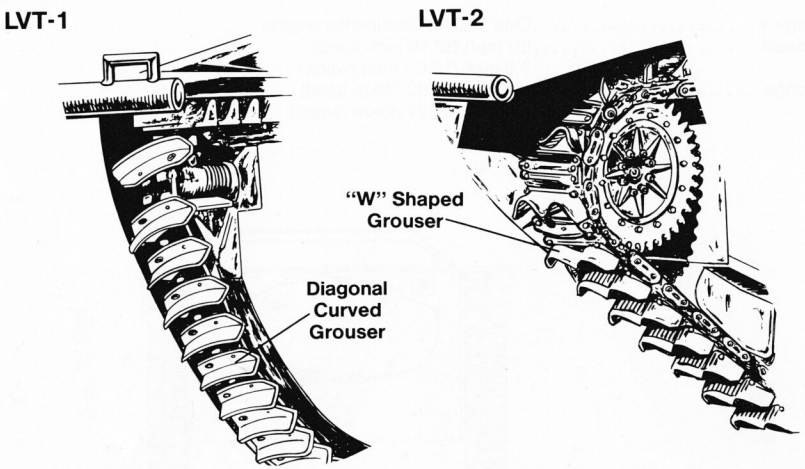


To prevent the Water Buffalo, as the vehicle was nicknamed, from shedding its track, the track guides were positioned higher than usual to alleviate the problem. Between the new suspension arrangement and new track the overall ride of the LVT-2 was far superior to the LVT-1 and vehicle life expectancy was three times that of the LVT-1.

Due to its larger size, the LVT-2 could carry more men (twenty-four instead of twenty) than the LVT-1 and nearly a ton more cargo. The three man crew consisted of a commander, driver and an assistant driver who doubled as a radio operator. When carrying a full load of troops the AMTRAC was extremely crowded. (FMC)

Though the basic LVT-2 was unarmored, it could carry heavy firepower on the forward cabin and railing which ran around the compartment. The plexiglass windows in the front of the vehicle could be lowered to provide the crew with a means of escape if the need arose. (FMC)

Grouser Development



LVT(A)-2

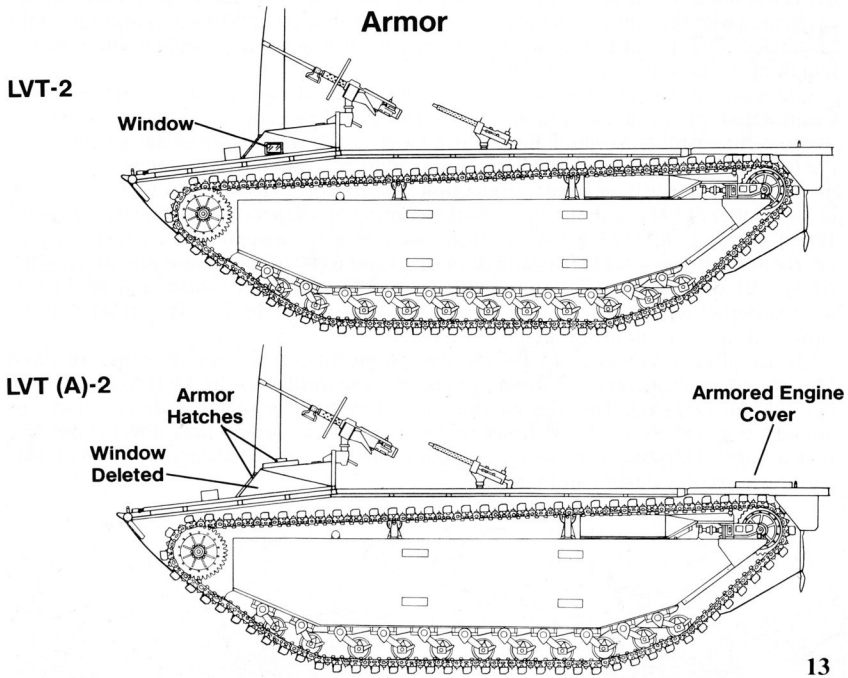
The LVT(A)-2 was a further development of the LVT-2 "Water Buffalo." This was the only vehicle in the series to carry the armored (A) designation which was not equipped with a gun turret. The LVT(A)-2 resulted from an Army requirement for an armored AMTRAC which was circulated during 1942 with the initial designation of T33. As the LVT-2 and LVT(A)-1 were then under development, the armored features of the LVT(A)-1 were incorporated into the basic LVT-2 design to produce an armored version for the Army. While similar in appearance to the LVT-2, the armored variant had some noticeable differences, mainly in the cab area.

Instead of the clear plexiglass windows in the front, an armored hatch was fitted for the driver which could be opened or closed depending on conditions. Overhead hatches with periscopes were also provided for the driver and radio operator. Armor thickness around the cab area was one half inch, while quarter inch armor was added to the hull, raising the overall weight a little over a ton. This lessened overall cargo capability by an equal amount. Internally, the only major change was the addition of self-sealing gasoline tanks to cut down on the danger of fire and explosion.

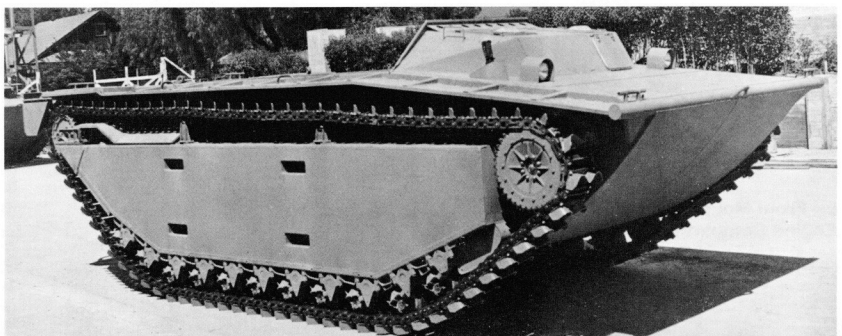
Production of the LVT(A)-2 began in 1943 and ran though 1944, 450 being produced, all of which were delivered to the Army. Additionally, starting in March of 1944, armor was added to all standard LVT-2 cabs on the production line, giving them a similar appearance to the LVT(A)-2s. Some 1,000 regular LVT-2s were produced in this configuration before production halted at the end of 1944. These vehicles, however, were not given the (A) designation.

In addition to these production lines addition of armor plating, special armor kits were designed which could be welded to AMTRACs which were scheduled for the lead waves in amphibious assaults. These contained sheets of one-half and one-quarter inch steel plates which were welded onto the LVT's, the thicker plates being used to protect the cab and bow, while the thinner ones were used on the sponsons. These kits came about as a result of the experiences of LVT crews during the invasion of Tarawa when makeshift armor was applied to the LVT-1s and LVT-2s. Additional armor was sometimes added by individual units to supplement these kits. As with the late model LVT-2s which received armor at the factory, no (A) was added to the designation of these modified vehicles.

The driver and assistant driver were provided with overhead escape hatches on the LVT(A)-2 which were fitted with periscopes for observation when under fire. Armament was the same as the unarmored version but cargo capacity dropped by half a ton due to the weight of the additional armor. (FMC)



An armored version of the Water Buffalo was also manufactured under the designation LVT(A)-2. This model had various panels of quarter inch and half inch armor plating over critical areas in place of the sheet steel used on the unarmored variant. Additionally, the cabin windows were deleted and replaced by an armored flap for the driver which could be raised when not in use. (FMC)



LVT-4

One of the biggest shortcomings of both the LVT-1 and LVT-2 was the location of the cargo compartments. Due to the engine being in the rear, there was no direct access to the compartment and all equipment and supplies had to be hoisted over the sides. In addition, troops were forced to climb or jump from the cargo hold onto the beach during an assault, causing unnecessary exposure to enemy fire. Because of the rear mounted engine, the drive line also ran through the compartment, further restricting the size and types of cargo which could be carried.

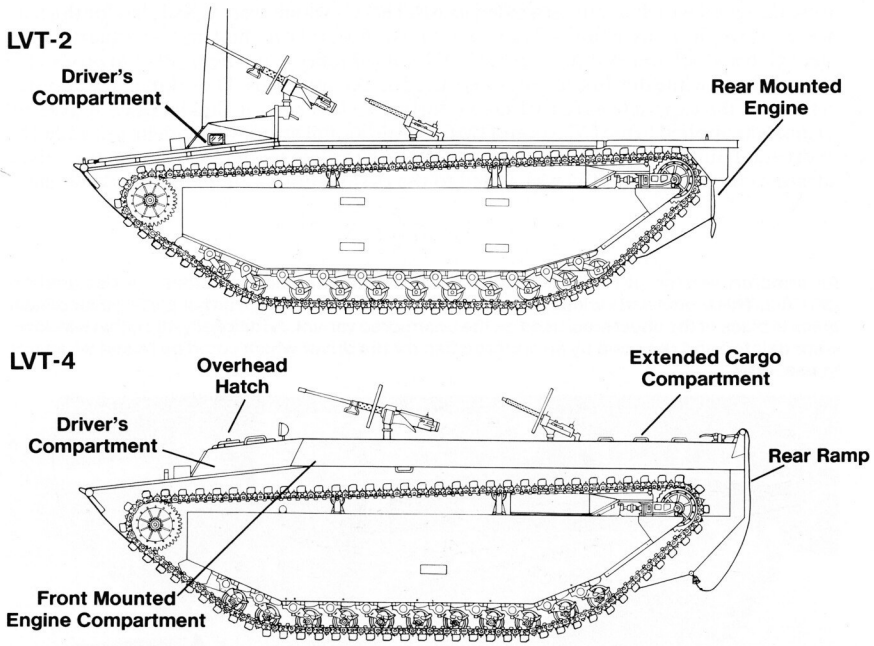
In order to alleviate this problem, engineers at FMC began work on modifying the existing LVT-2 design to incorporate a rear ramp for direct access to the cargo compartment. The new design basically retained the forward section of the LVT-2 up to the drivers area, but moved the engine forward to a position right behind the driver. This allowed the cargo compartment to be extended to the rear of the hull where a hinged ramp was added. When lowered, this ramp made it possible to move cargo fairly easily into the hold. It also made it possible to carry jeeps and 105MM howitzers which provided the troops with much needed fire support early in an invasion.

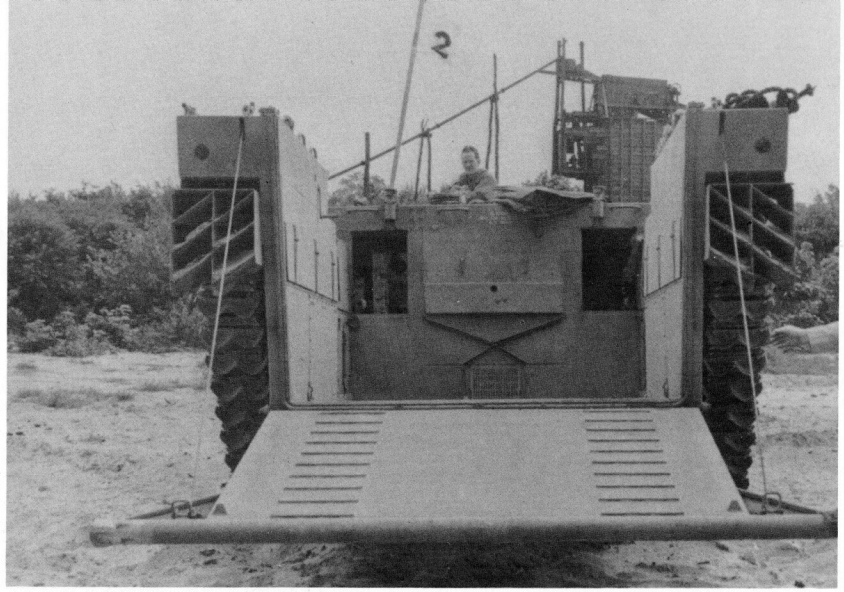
While the addition of the ramp necessitated some major redesigning, the basic components used in the LVT-2 were retained for simplicity, logistical purposes and proven performance. These included the suspension, tracks, engine and transmission, all of which were used with little, if any, modification. Unfortunately, the ramp needed to be very substantial for moving cargo over it and, with its winch, caused a weight gain of slightly over a ton. This weight gain cut the land speed from thirty-one MPH to twenty MPH but did not noticeably affect the water speed. Due to the more open nature of the cargo area with the removal of the drive train, an additional 2,500 pounds of cargo could be carried. The forward placement of the engine also made it possible to increase the length of the hold by nearly two feet.

Navy and Marine officials were pleased with the new design, and after tests the vehicle was ordered into production as the LVT-4. The LVT-4 preceded the LVT-3 into service, due to various problems which Borg Warner was having with their new design, but it was not felt worthwhile to switch the designation of the two vehicles so that they would be in numerical sequence by service introduction. The first order for the new LVT was placed in November of 1943, with the first vehicles coming off the production line by the end of 1943. Eventually, 8,351 LVT-4 Water Buffalos came off the assembly line, accounting for nearly one half the total LVT production run. Over 6,000 of these were procured by the Army, with the Marines receiving slightly over 1,700 vehicles. An additional 500 LVT-4s were supplied to the Allies under Lend-Lease during World War II and later under various arms agreements in the postwar years.

In addition to the regular LVT-4, there was some interest on the part of the Army and Marines to manufacture an armored version of it similar to the LVT(A)2 under the designation LVT(A)3. This designation was chosen since the (A)4 designation was already assigned to the 75MM howitzer version but the vehicle was never produced. Instead, armor kits were provided to upgrade protection as needed depending on the role a unit was to play during an invasion.

One of the tactical shortcomings of early AMTRACs was the lack of direct access from the ground. Troops and cargo had to be loaded/unloaded over the side which restricted cargos that could be carried and subjected troops to enemy fire when they disembarked. This led to the development of the LVT-4 which relocated the engine behind the drivers compartment and had a rear loading ramp. (FMC)

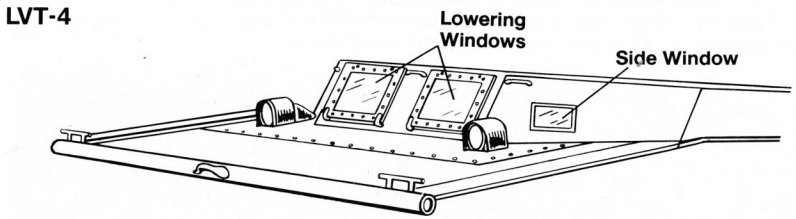


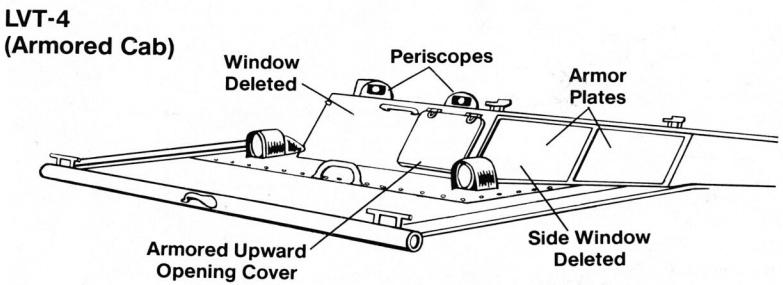


The rear ramp on the LVT-4 allowed easier loading/unloading of troops and cargo along with giving the LVT-4 a wider range of cargo it could carry. The forward location of the engine also eliminated the transmission housing which had divided the compartment in the LVT-2 series, further enhancing the cargo carrying capability of the LVT-4. (National Archives)

Equipment, such as jeeps or artillery, could be carried and easily unloaded via the rear ramp which allowed troops to use them almost immediately in the initial stages of an assault. This 105MM howitzer has just been lashed down prior to being ferried across a river. While it is a tight fit, the larger cargo bay of the LVT-4 allowed such loads to be carried and quickly deployed. (National Archives)

Armored Cab

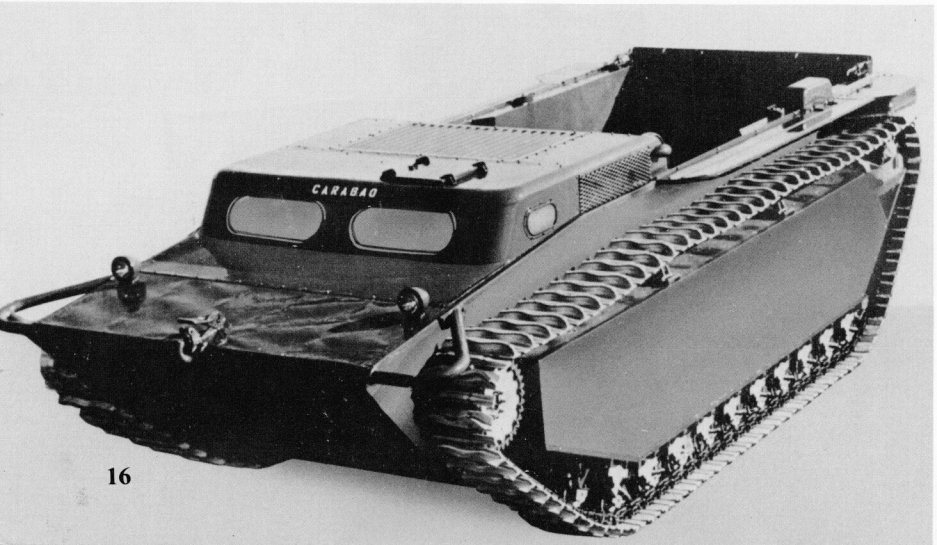




Another means of carrying howitzers was to lash them to a special fitting installed across the top of the cargo compartment. The British experimented with a similar arrangement for carrying a 6 pound anti-tank gun across rivers in the European Theater which they used with some success. (Patton Museum)

The LVT-4 was similar to the LVT-2, other than the front drivers compartment which was extended out to the sides, and the rear ramp. The weight of the rear ramp caused a drop in speed but this was considered acceptable because of the additional cargo space and ease of loading and unloading. (FMC)

In 1945 a lightweight version of the LVT-4 was designed which did away with the armament, used thinner sheet metal, and substituted aluminum for some of the steel construction. This version was intended for cargo use only and could carry an additional two tons of cargo. (FMC)



An armored version of the LVT-4 was considered but it was decided instead to supply armor kits for installation in the field. Since the designation LVT(A)-4 was already assigned, these were referred to as LVT-4 (Armored Cab). (National Archives)

LVT-3

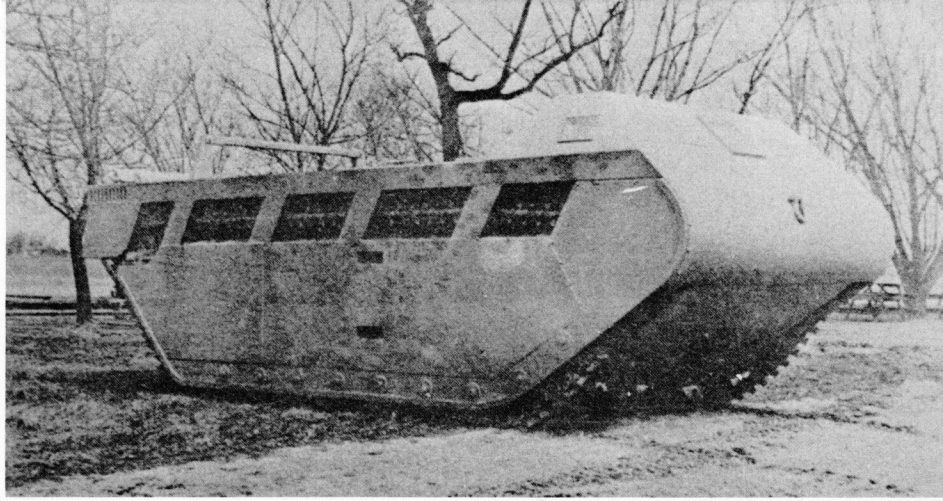
During the initial design phase of the LVT-1, the BuShips had solicited the help of the Morse Claim Company, a division of Borg-Warner, for assistance with the project. After viewing the Roebling Alligator in operation, the engineers from Borg-Warner came to the conclusion that the only way to solve the problems with the Alligator was to completely redesign it. They began work immediately on their own pilot vehicle, which was completed in August of 1942, six months after the start of the project. Designated Model A, the vehicle was not a complete redesign but rather a combination of new ideas based on the original Alligator. Using the basic Roebling cleat design, Borg-Warner engineers removed the rollers from the tracks, increased their size and placed them at the bottom of the sponsons. They also incorporated larger roller wheels and drive sprockets which were coupled to a fully automatic transmission. An interesting feature was the use of corrugated steel on the outside which gave a higher overall strength at a lighter weight. Another feature which was unique was the ability of the vehicle to be converted from its basic cargo carrier model to an armored amphibian version by adding the turret from the M3 Stuart light tank.

Unfortunately for Borg-Warner, their new design did not offer a significant improvement over the new FMC-built LVT-2 to warrant production. However, the use of the M3 turret led to the use of this design feature on the FMC LVT(A)-1 amphibious tank, which began coming off the production line in December of 1943. In turning down the Borg-Warner proposal, officials cited a too similar track arrangement to the original Roebling design and less cargo capacity when compared to the LVT-2. These were the specific reasons for not accepting the Model A for service use.

Upon receiving this information, Borg-Warner decided to extensively redesign the Model A so that it would be acceptable to the military. Designated Model B, this version took a major step away from previous LVT design by mounting twin Cadillac V-8 engines in the sides of the hull rather than in the front or rear as in previous models. This allowed for greater interior room when compared to current LVT models without an increase in overall dimensions. In fact, the length actually decreased in comparison to the LVT-2 and LVT-4 (by two feet). Of particular significance was the fact that the interior length available for cargo increased by over four feet.

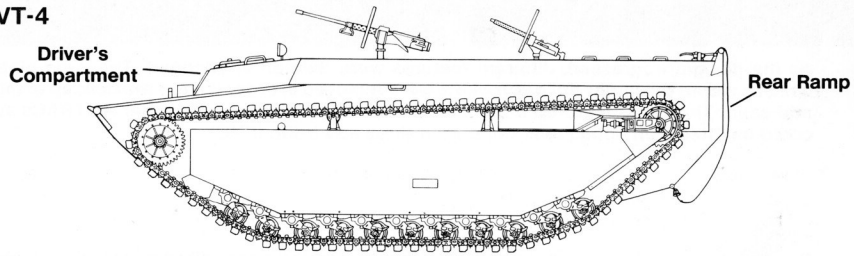
The Model B, later designated LVT-3 by the military, was also equipped with a rear ramp similar to that fitted to the LVT-4 which allowed the vehicle to carry longer loads in its hold, such as various jeep and trailer/gun combinations and artillery pieces. Borg-Warner also decided to use the transmission from the M5 light tank which was also powered by the same Cadillac V-8 engines used in the AMTRAC. This transmission, a automatic four speed and reverse type, allowed a smooth transition when the LVT went from the water to the beach without the driver having to shift gears, one of the most difficult tasks faced by the driver. In other respects, however, the Model B used already proven components from the earlier LVT-2 and LVT-4, including the same track and grouser pattern and the torsilastic suspension.

In overall configuration, the new LVT differed greatly in appearance from the previous FMC designs. Unlike the LVT-2 and LVT-4 which had long pointed bows, the Model B was somewhat similar in appearance to the original Roebling LVT-1 with the cab sitting right on the bow. This was accomplished due to the mounting of the engines on the sides rather than in the front or rear. Due to its large cargo space, the Model B carried 3,000 pounds more cargo then the LVT-4 yet was about half a ton lighter. Although somewhat slower, it had the same range as the LVT-4 while needing less fuel.

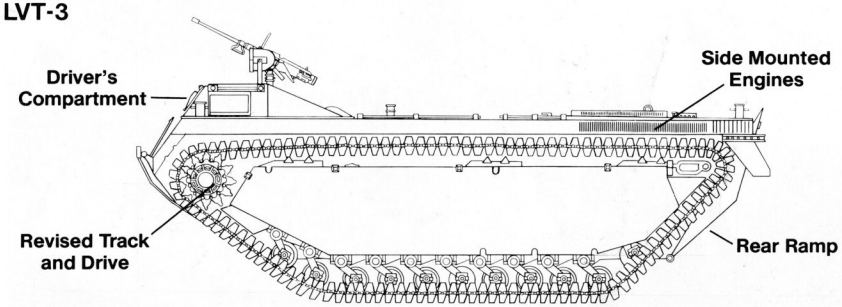


Based on earlier work, Borg-Warner entered this design into competition for LVT contracts. Though their earlier Model A had been rejected by the Navy, their Model B was the first AMTRAC to be fitted with a rear ramp. The Model B mounted the engines in the side sponsons and moved the driver's cab further forward, creating a much larger cargo area. (Hunnicutt)

LVT-4



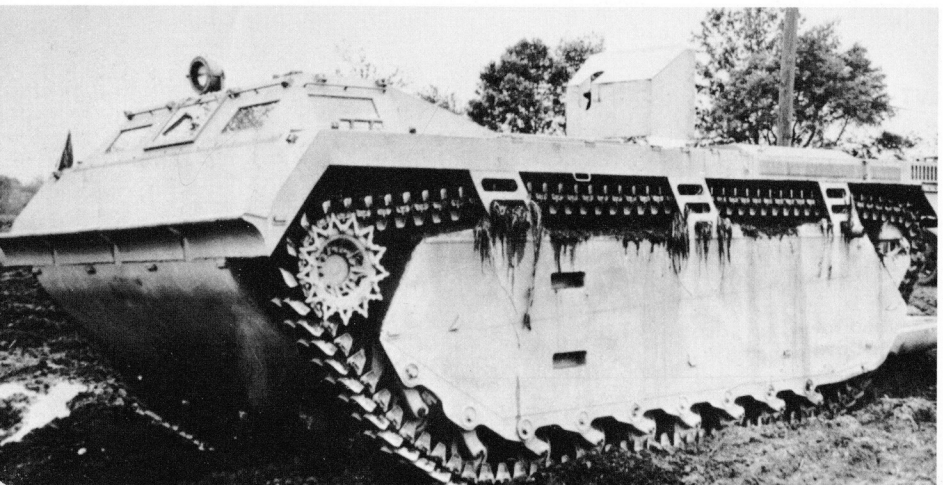
LVT-3

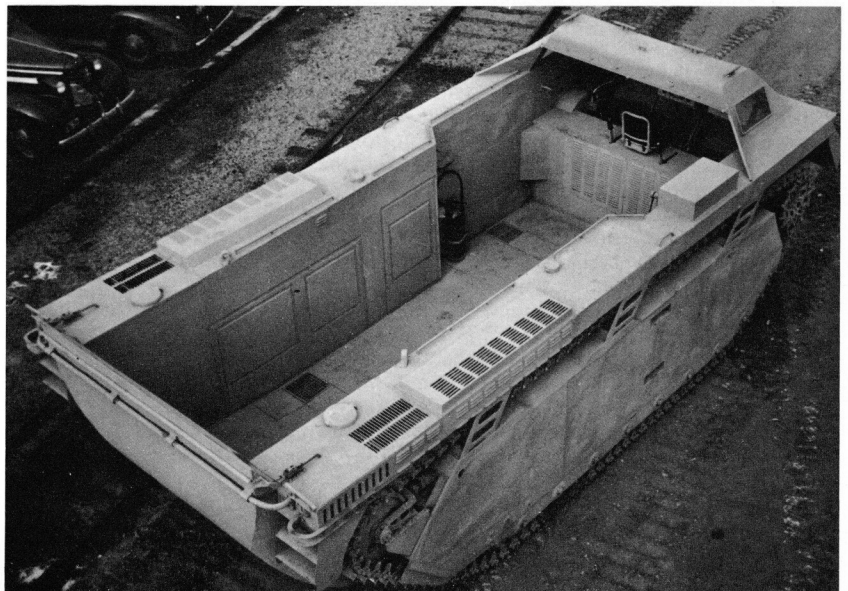


As the design progressed, different features were deleted or changed. The large plates which covered the larger drive sprockets were removed in order to stop the buildup of mud and sand. The LVT-3 featured a track and suspension similar to the other AMTRACs and could be fitted with applique armor on the sides and front. (FMC)

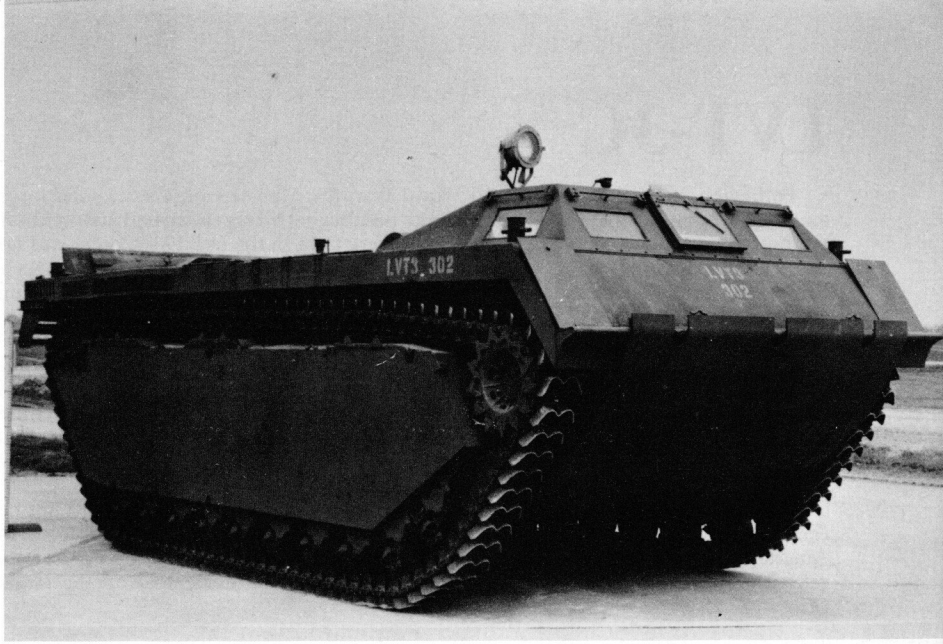
By moving the engines into the side sponsons, the cargo bay was substantially enlarged. The rear ramp allowed for a greater variety of cargo to be carried since it could be directly loaded and unloaded without the need of a crane. The engines were 110 horse power Cadillac V-8 power plants which drove two Hydromatic transmissions controlled by a single steering unit. (FMC)

The rounded nose became less obvious as flat steel plates were bolted on to it. Eventually, the braces above the pontoons were also removed. The box-like structure in the middle of the vehicle is an armored shield for a machine gun. (Patton Museum)



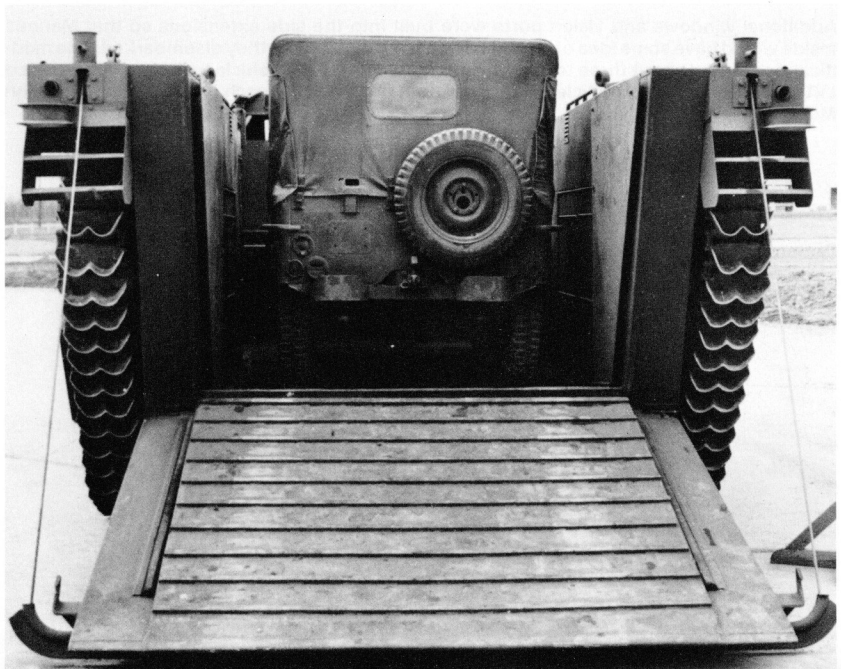


The prototype was delivered for testing to the Marines at Camp Pendleton, California in the Summer of 1943. After its evaluation, Navy and Marine officers stated they were impressed by the new design and its performance. The only significant change they requested was for the replacement of the armor plating with steel, but with provisions for added armor in kit form when the situation warranted. Borg-Warner then was given the go ahead for production in the Spring of 1944. The contract called for 1,800 vehicles under the designation LVT-3. Unfortunately, it took time to get the new AMTRAC into production and to stockpile sufficient spare parts to support the LVT-3 in combat. This, coupled with the need to train crews and maintenance personnel, resulted in the first LVT-3s, nicknamed Bushmasters, only getting into service in time for the Okinawa invasion in the Spring of 1945. Eventually, 2,964 Bushmasters were completed during 1944 and 1945, with all but two going to the Marines.

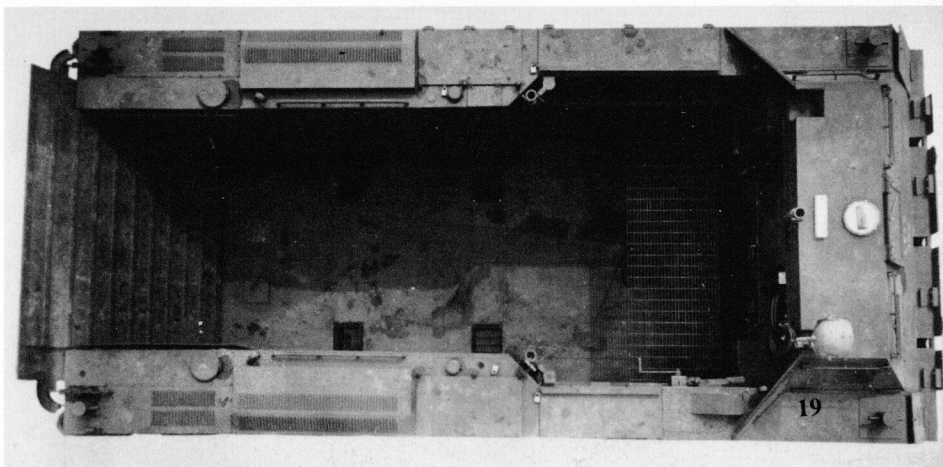


This production LVT-3 was tested at the U. S. Army's Aberdeen Proving Grounds in the spring of 1945. Aside from the more angular profile of the nose and the addition of applique armor to the belly of the vehicle, it was very similar to the original Model B. (Patton Museum)

A jeep could easily be driven into the LVT-3 with space to spare since it only took up about two thirds of the cargo bay length. This feature allowed critically needed supplies to be carried and quickly unloaded on a hostile beach. (Patton Museum)



The movement of the driver's cab as far forward as possible and the placement of the engines in the sponsons allowed the LVT-3 to carry 3,000 pounds more cargo than the LVT-4, yet the vehicle was lighter and shorter in length. Machine guns could be mounted just behind the cab and on the sides of the sponsons. (Patton Museum)

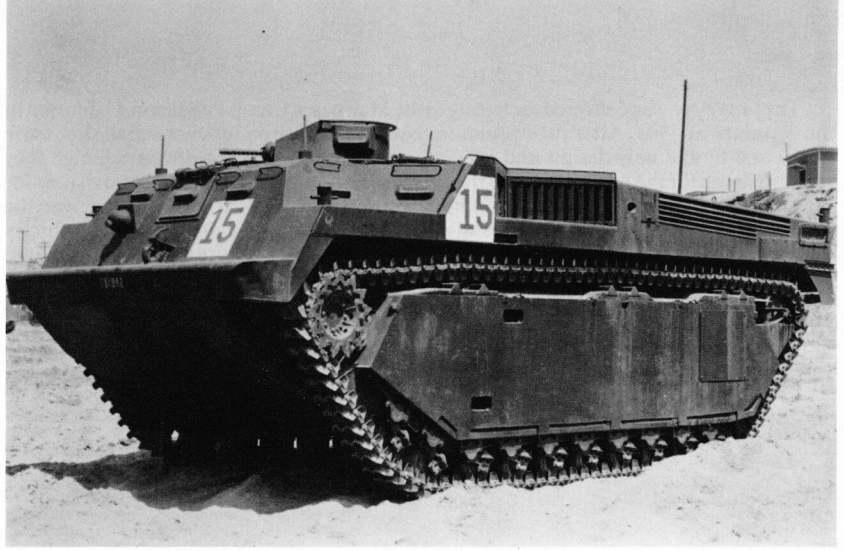


LVT-3C

Following the end of the Second World War, the Marine Corps stockpiled large amounts of equipment in storage, including a number of LVT-3s which had just come off the production line. With money for defense very tight in the late 1940s, there was no chance that existing AMTRACs would be replaced by a new series of vehicles. As a result, the Marines decided to take 1,200 low mileage LVT-3s and modernize them during 1949.

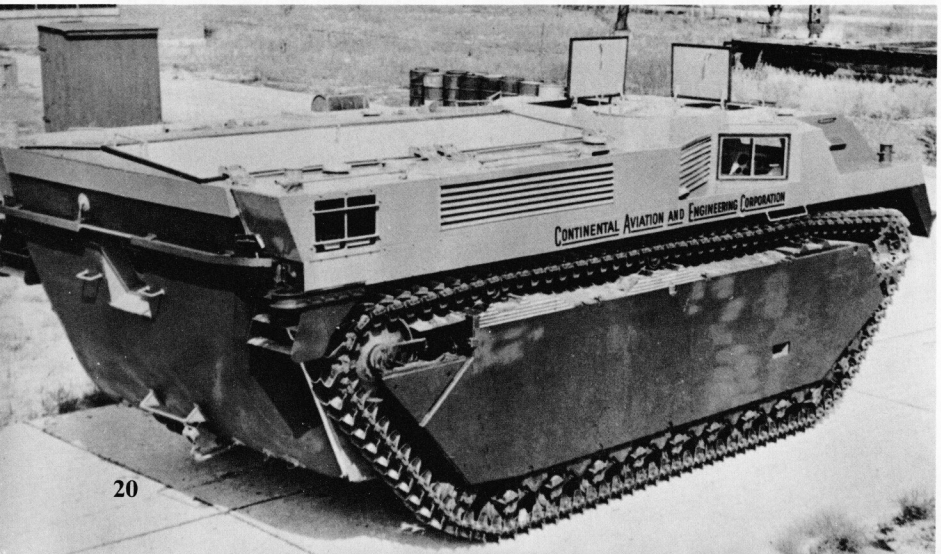
The conversion done by Continental Aviation and Engineering was relatively straightforward and simple. The cargo compartment had its sides raised behind the cab until they were level with it. Overhead hatches were added to provide protection from shrapnel and grenades and to prevent water from entering the compartment. A small machine gun turret was added on top the hull between the forward hatches. These modified vehicles were given the designation LVT-3C, the "C" indicating covered and were used extensively in the Korean War.

By the end of the Korean War, it was realized that the LVT-3 series could not be economically kept in service much longer. A number were rebuilt for distribution to American allies under various defense agreements and the remaining LVT-3s were retired and put into storage or disposed of through scrap dealers or on the target range.

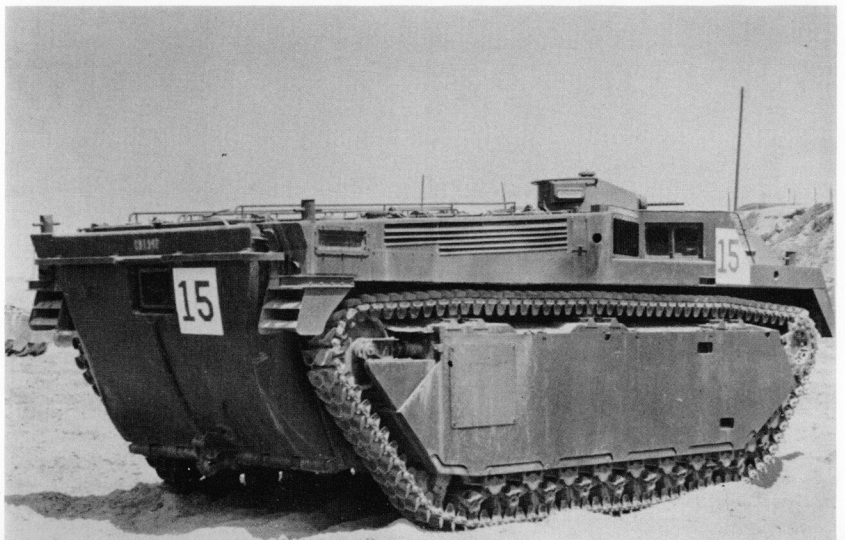


In addition, a small machine gun turret was added on top the cabin while another machine gun was fitted in a ball mount on the front hull. The original windows were replaced with vision ports which further enhanced the protection for the crew. (Patton Museum)

In the late 1940s, the Marine Corps decided to modify 1,200 low mileage LVT-3's in order to improve their combat efficiency. Continental Aviation and Machine Corporation carried out these modifications which included raising the sides and installing aluminum hatches over the cargo compartment. This modification provided protection from shrapnel and heavy seas while not degrading the combat capability of the vehicle to any large extent. (Patton Museum)



Additional windows and vision ports were built into the side extensions so that Marines inside would have some idea of what the terrain was like before they disembarked. The modifications added about three tons to the overall weight of the vehicle which was designated LVT-3C. Work on these vehicles was carried out at the Long Beach Naval Shipyard. (Patton Museum)



LVT(A)-1

During the early development of the LVT-2, the Marines inquired about the feasibility of FMC designing an armored version of the vehicle fitted with a large caliber gun. Borg-Warner, also involved in designing their own LVT, also was working on a similiar version. While the FMC design was only fitted with machine guns, the Borg-Warner vehicle was equipped with the 37MM turret from the M3 Stuart light tank. This vehicle could be converted back to a cargo carrier by removing the turret and its associated plating, which gave it great versitility.

Borg-Warner's design, however, did not impress Navy officials who felt the vehicle was mechanically similiar in many respects to the original Roebling design. They viewed the newer FMC vehicle as an overall better design and consequently opted to go ahead with the FMC AMTANK over the Borg-Warner vehicle.

Despite this failure, Borg-Warner did make a significant contribution to the LVT program with their idea for the M3 gun turret. The original FMC proposal called only for machine gun armament, but fears over the possibility that amphibious forces might meet Japanese armor when they hit the beaches, prompted the decision to have heavier armament on the armored AMTANKs. The largest gun that could be mounted on the LVT, due to weight and space restrictions, was the M6 37MM tank gun due to weight and space restrictions.

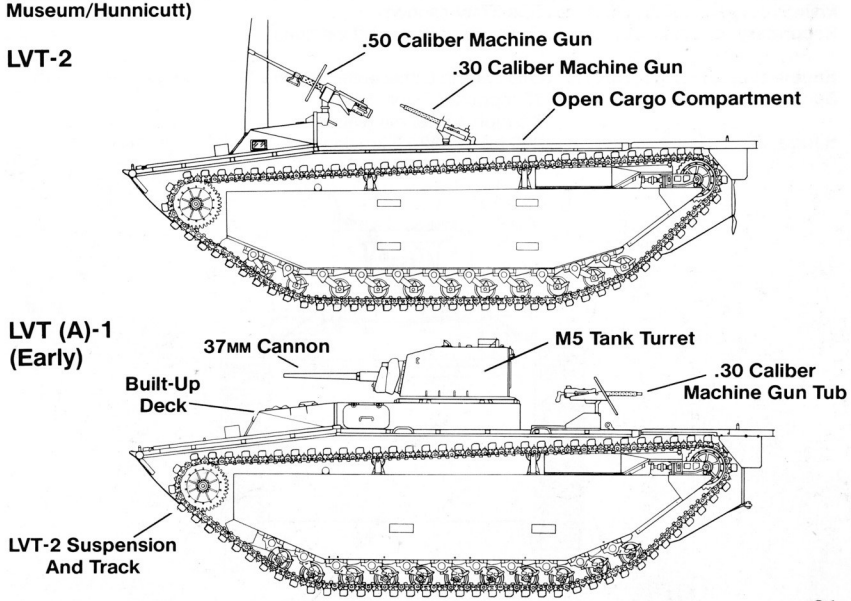
As a result, it was decided to use the turret off the M5A1 Stuart except for the rear radio bustle which was removed, since there was adequate room inside the vehicle for communications gear. The turret itself was power driven and gyro stabilized which allowed for more accuracy when firing on the move. A 30 caliber machine was also mounted coaxially with the 37MM cannon.

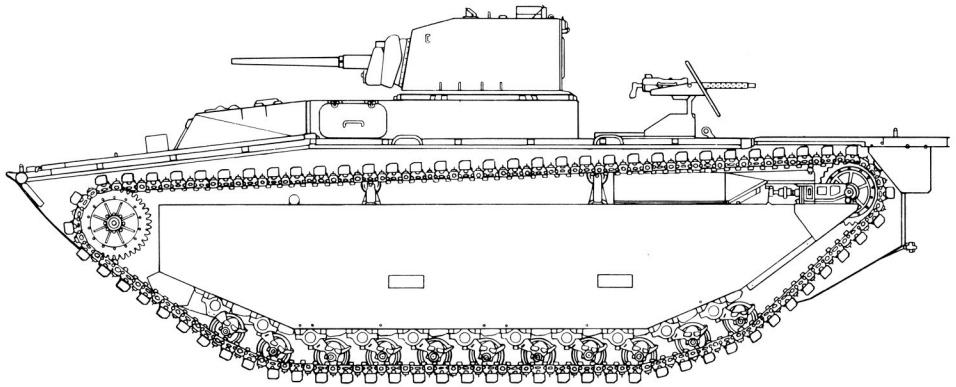
The basic LVT-1 had the cab top and sides extended over the cargo compartment and was fitted with varying thicknesses of armor plate, ranging between 6MM and 12MM. At the rear, two small gun tubs were fitted armed with 30 caliber machine guns on scraf rings (later changed to Mark 21 mounts) to provide supression fire and close-in protection. Access hatches to the hull were situated on both sides in front of the turret and on the top over the driver and radio operator's positions. These two hatches were also fitted with periscopes for when the vehicle was buttoned up. In addition, the driver had a hatch in front of him that could be opened, when conditions permitted, for better forward vision. A smaller slotted plate was provided on later models for the radio operator that slid up for better visibility.

As with any vehicle, the LVT(A)-1 incorporated changes gleaned from battlefield experience during its production life. In place of the radio-operators vision flaps, an additional 30 caliber machine gun was fitted for increased forward firepower. Armored covers were installed over the unprotected engine gulls in the rear for protection against close-in assaults by fanatical Japanese infantry. Finally, additional armor protection was added to the rear gun tubs so that only the tops of the gunner's heads were exposed.

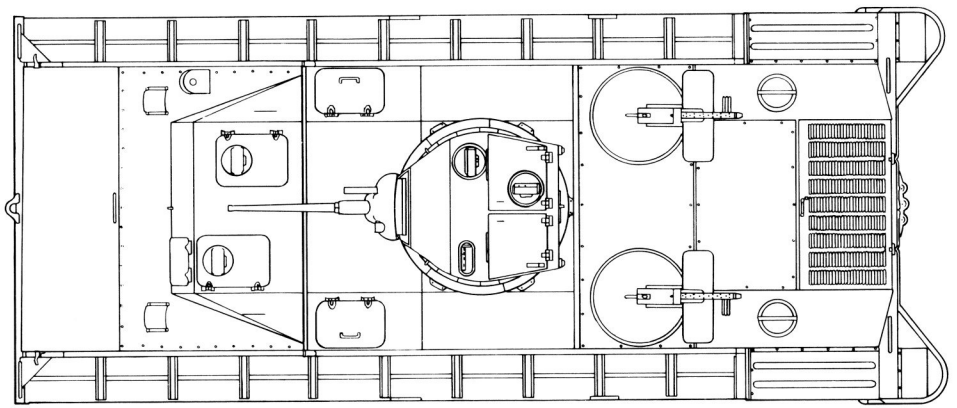
Production of the LVT(A)-1 started in December of 1943, with the first vehicles coming off the assembly line in early 1944. The final model came off the line in late 1944, with a grand total of 510 being completed. Of these, nearly 328 vehicles were acquired by the Army while some 182 were used by the Marine Corps. None were provided to the Allies under Lend-Lease agreements. The LVT(A)-1 was quickly superseded by the LVT(A)-4 which carried a heavier gun, although some were still in use during the invasion of Okinawa.

Early in the development of the LVT-2, Marine officials inquired about producing an amphibious tank based on the chassis. FMC responded with a machine gun armed vehicle while Borg-Warner developed a version fitted with an M3 light tank turret. While the officials liked the armament, they did not feel the Borg-Warner vehicle offered any improvement over the LVT-1. As a result, it was decided to mount the turret on the basic frame of an LVT-2. (Patton Museum/Hunnicutt)





Specifications



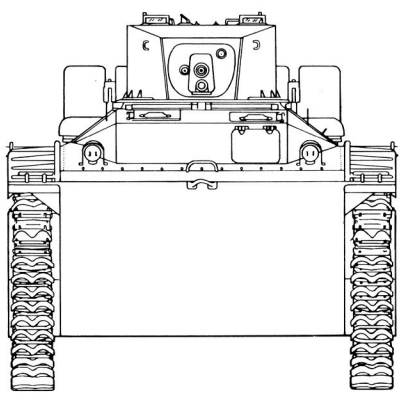
LVT(A)-1

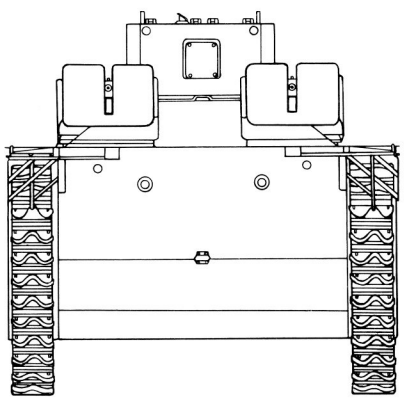
Crew ..... Five

Length ..... 26 feet 1 inch (7.95m)
Width ..... 10 feet 8 inches (3.25m)
Height ..... 8 feet 1 inch (2.46m)
Weight ..... 30,000 pounds (13,608 kg)

Armament
Main ..... One 37MM cannon
Secondary ..... Three .30 caliber machine guns

Engine ..... One 250 hp Continental engine
Speed ..... 20 mph/32.18kmh (land)
7.5 mph/12.06kmh (water)
Range ..... 300 miles/482.79 km (land)
150 miles/241.39 km (water)

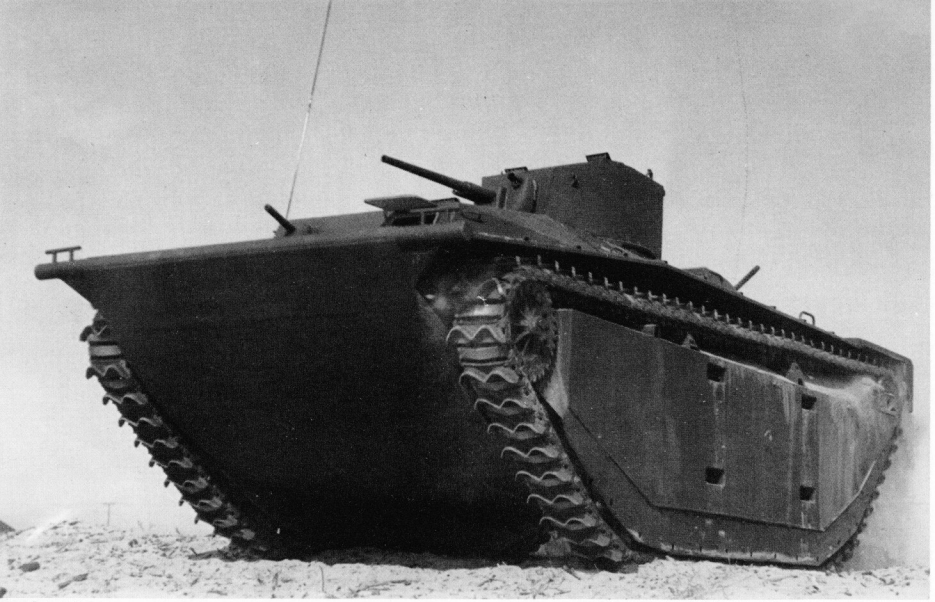




The basic LVT-2 hull was modified by extending the cabin back over the cargo compartment and fitting the turret and its basket approximately in the center of the vehicle. To supplement the firepower of the 37MM cannon, two machine gun tubs, each equipped with a .30 caliber machine gun, were fitted behind and on either side of the turret level with the main deck of the AMTANK. (FMC)

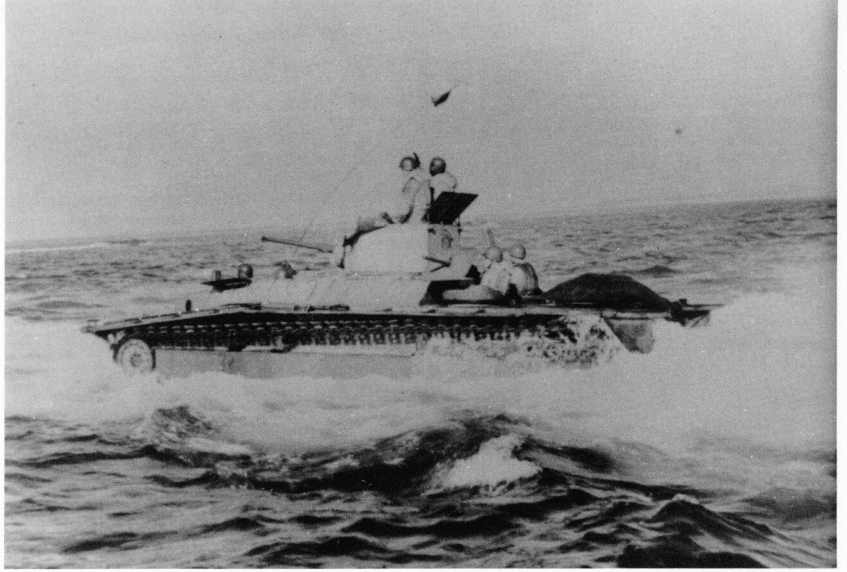
An early production version of the LVT(A)-1 rolls out from the FMC plant in Riverside, California. Later models had larger armor shields around the gun tubs and protective covers over the rear engine louvers. (FMC)

Aside from the addition of the turret and superstructure, the hull of the LVT(A)1 remained essentially the same as the LVT-2. The rear sprocket had an idler adjusting screw which adjusted track tension. This replaced the hydraulic jack which had been used on the LVT-1. The small square place on the back of the turret is an access hatch for removal of the 37MM gun. (FMC)



Late production models also had an additional .30 caliber machine gun mounted in front of the assistant driver's position. They also had four step pockets cut into the side pontoons as compared to two step pockets found on early production models. (FMC)

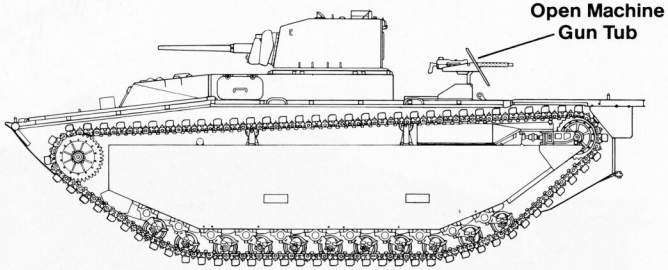
The LVT(A)-1 could climb a 60 percent grade with reasonable ease, although this exposed its underside to enemy fire and hampered the use of the main gun which could only depress 10 degrees. Initially designed to provide protection against Japanese tanks during the early stages of a landing, it was later found that this menace was almost non-existent and the AMTANKS were used in the direct fire support role. The small 37MM gun, however, was unsuited for this and requests were made for a larger weapon. (FMC)



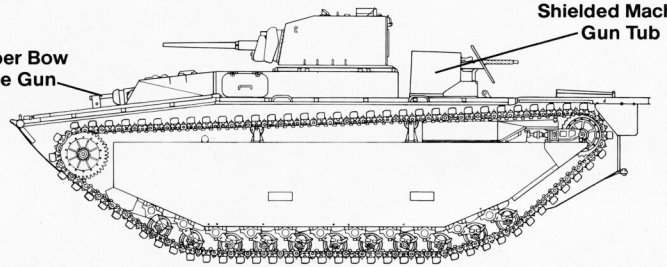
The LVT(A)-1 was the first successful U. S. amphibious tank and paved the way for later developments which carried heavier armament and more refined fire control. With a speed of seven mph in the water and twenty-five mph on land, along with fairly good seakeeping characteristics, the AMTANK provided the troops with direct fire support as they approached the beaches. (National Archives)

Amtank Development

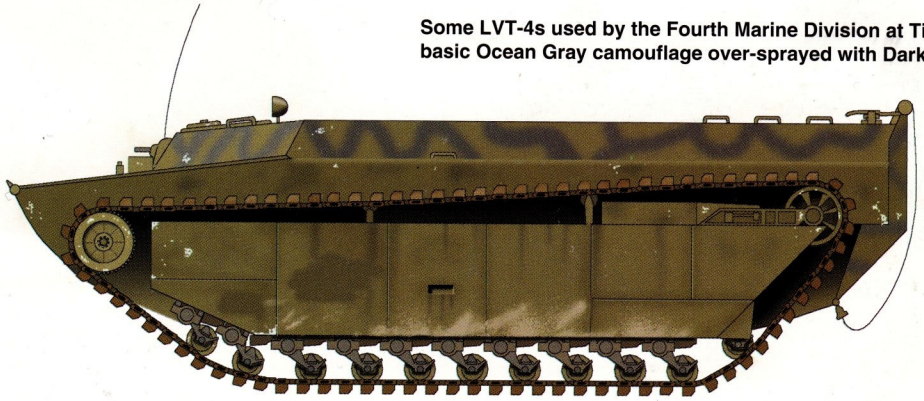
LVT (A)-1
(Early)



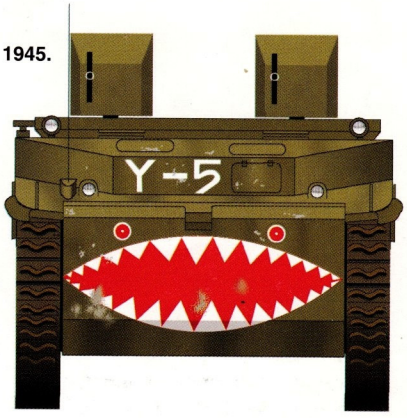
LVT (A)-1
(Late)



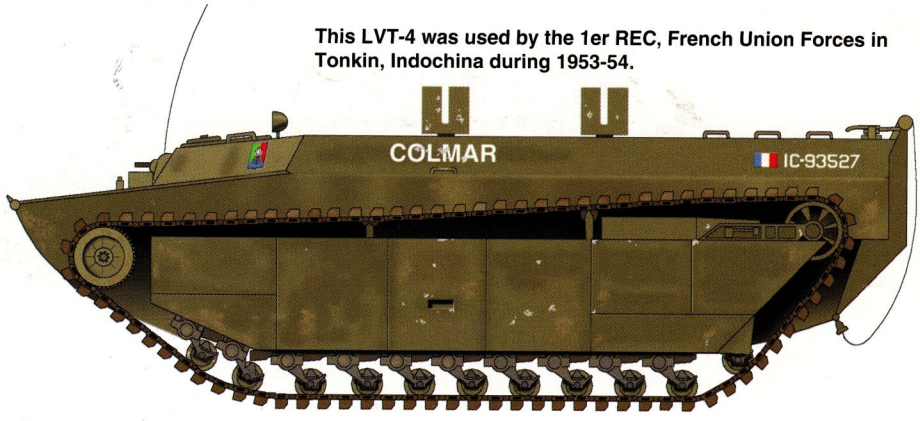
Some LVT-4s used by the Fourth Marine Division at Tinian in July of 1944 had their basic Ocean Gray camouflage over-sprayed with Dark Green.



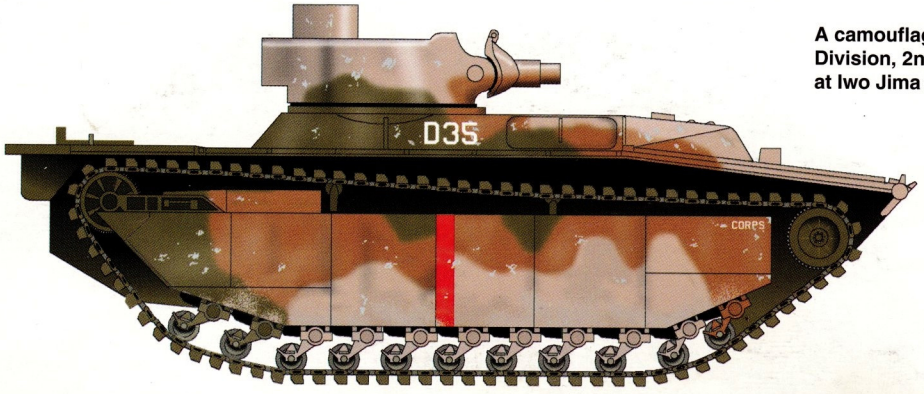
A sharkmouthed LVT-4 of the U.S. Army in the Philippine Islands during early 1945.

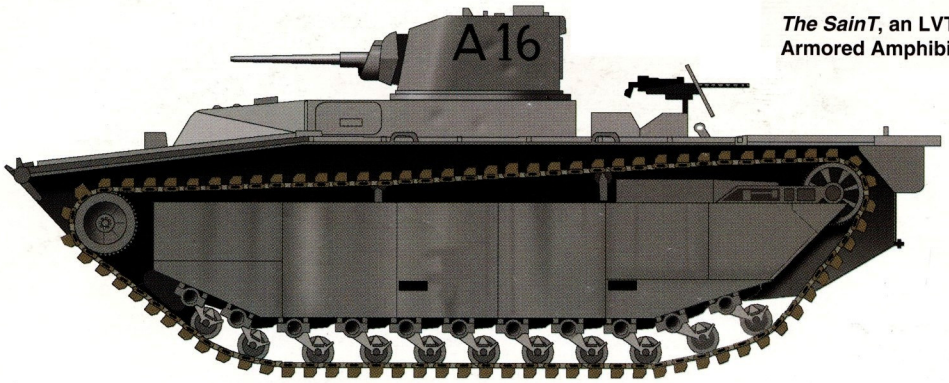


This LVT-4 was used by the 1er REC, French Union Forces in Tonkin, Indochina during 1953-54.



A camouflaged LVT(A)-4 of the 5th Marine Division, 2nd Armored Amphibious Battalion at Iwo Jima during February of 1945.

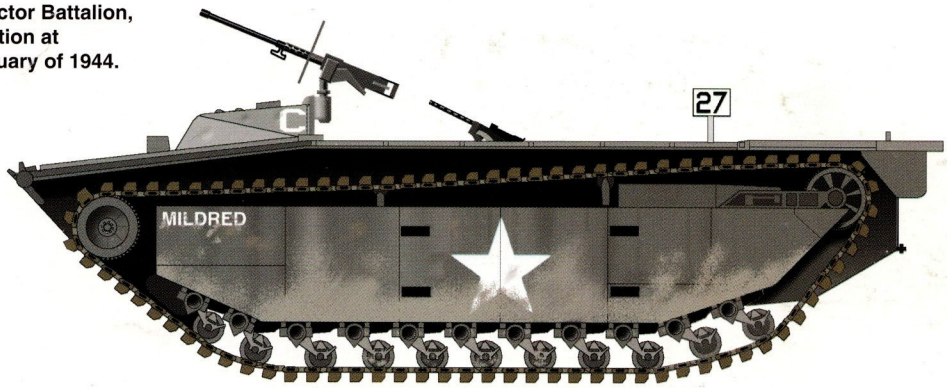


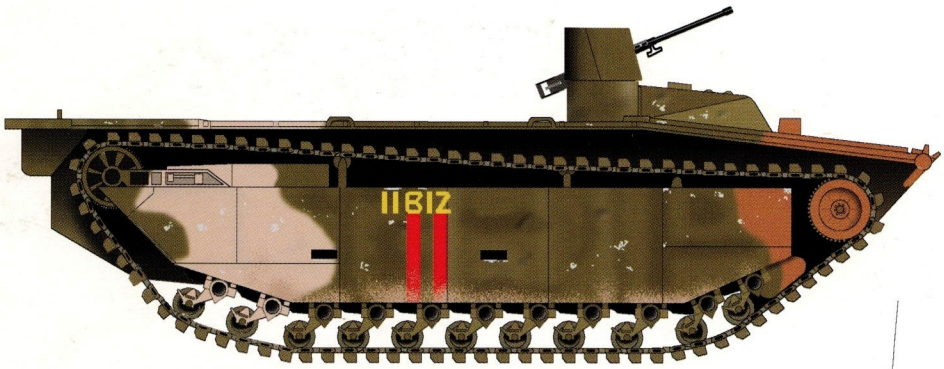


The SainT, an LVT(A)-1 of the 1st Marine Division, 1st Armored Amphibious Battalion during early 1944.

REAR PANEL

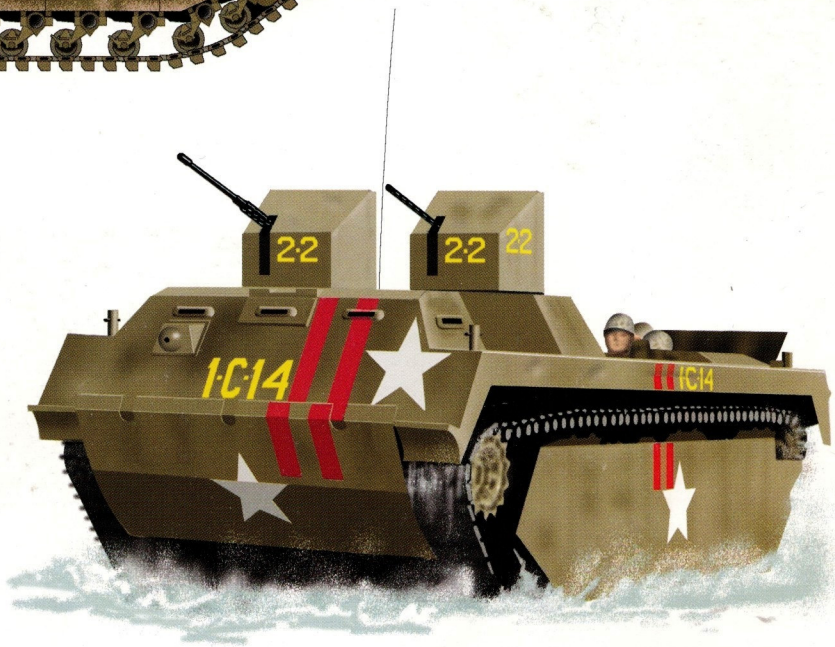
MILDRED was an LVT(A)-2 of the 708th Provisional Amphibious Tractor Battalion, Group Charlie which saw action at Kwajalean Atoll during February of 1944.





A number of LVT-2s used at Iwo Jima during February of 1945 were painted in a multi-colored camouflage scheme.

An LVT-3 of the 1st Marine Division, 1st Amphibious Tractor Battalion at Wonson, North Korea during 1950.



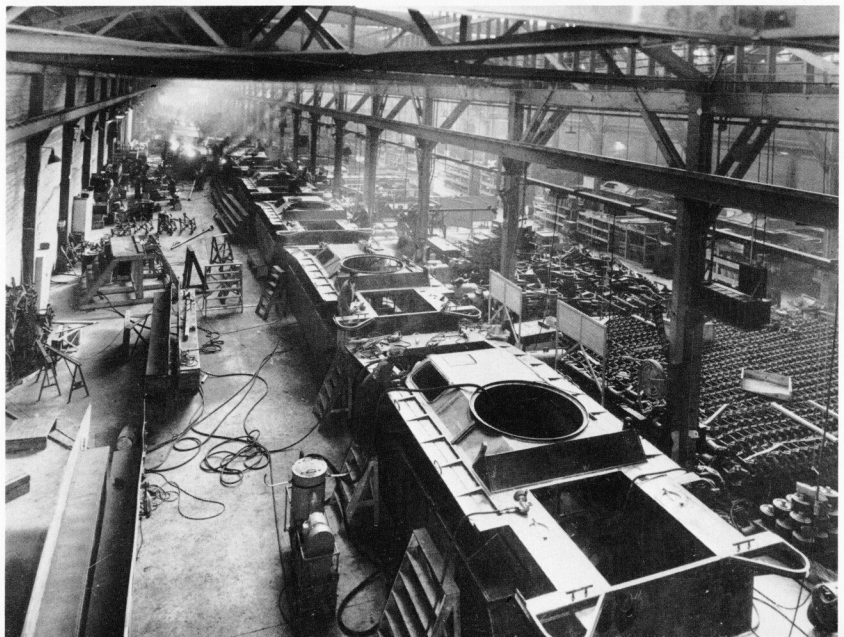
LVT(A)-4

While the LVT(A)-1 provided the initial wave of a Marine assault with much needed close-in support during the early critical hours of an amphibious invasion, the vehicle had its shortcomings. The most significant of these was the small 37MM cannon in the turret. While this gun was capable of handling rarely encountered Japanese armor, it was found to be less than adquate against the heavily fortified bunkers which were a trademark of Japanese defenses.

A number of military officers felt that the AMTANK needed a gun which offered a heavier explosive charge and traveled in a high trajectory. As a result, it was decided to fit the turret from an M8 Howitzer Motor Carriage to the AMTANK under the designation LVT(A)-4. This turret was equipped with a 75MM howitzer which had less than half the muzzle velocity of the 37MM cannon but which fired a high explosive shell. This gave it a much better chance of destroying Japanese fortifications since its blast effects were much more devastating than the impact of the high velocity 37MM cannon.

To fit this turret to the LVT required a major change in the configuration of the upper deck. Since the turret ring of the M8 HMC was much larger than the M5A1 ring, the superstructure was extended back over the rear gun tubs, resulting in the elimination of both machine guns. To compensate for this, a .50 caliber machine gun was carried in the turret on a small ring mount at the rear of the turret. Early vehicles had a partial cover over the rear of the turret which had the gun ring fitted into it. This partial roof was later done away with on mid and late production vehicles.

In order to increase the firepower of the AMTANK, the turret from the M-8 HMC was installed in place of the M5 tank turret. Armed with a 75MM howitzer, this gave the new vehicle, designated LVT(A)-4, better bunker busting capabilities which the small 37MM gun of the LVT(A)-1 lacked. The cover over the cargo compartment was extended rearward, eliminating the machine gun tubs, and the turret ring was enlarged. (FMC)

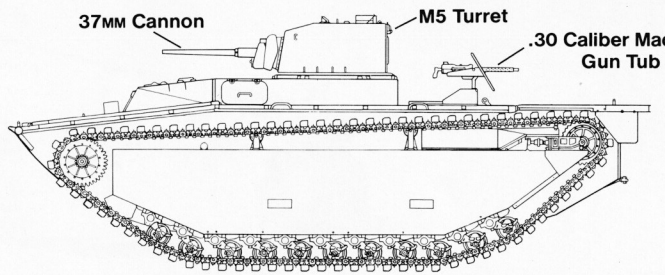


Although the use of the M8 HMC turret did give the new LVT(A)-4 more punch than the LVT(A)-1, it unfortunately had a number of serious shortcomings. Unlike the 37MM cannon in the M5A1 turret, the 75MM gun was not gyro-stabilized which made accurate shooting while on the move all but impossible. In addition, the deletion of the two .30 caliber gun tubs in the rear seriously weakened its defensive firepower. While the .50 caliber machine gun could be used for close-in defense, the gunner was very exposed due to its high position and lack of an armored shield. This became very evident during the Marianas campaign where the LVT(A)-4 was used during the invasion of Guam, Tinian and Saipan.

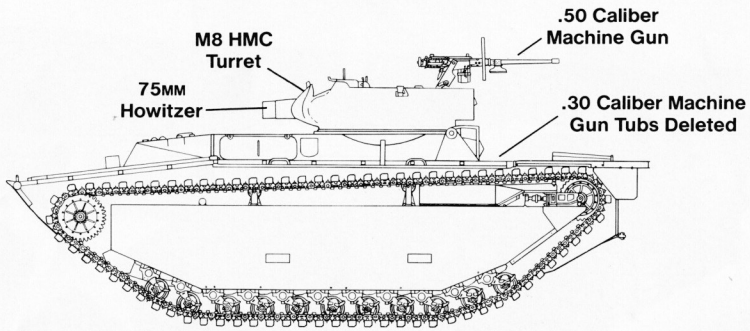
The open top of the gun turret also made the vehicle extremely vunerable to close-in assault by Japanese infantry and to mortar fire, a problem not faced by the LVT(A)-1. As a result, it was decided to modify the LVT(A)-4 in a number of ways to alleviate these problems. While no designation change occurred, the modified LVTs were known unofficially as the "Marianas Model." The rear roof and machine gun were removed and replaced with pintel mounted .30 caliber guns on either side of the turret. These were fitted with shields similiar to the ones used on the gun tubs of the LVT(A)-1. Another .30 caliber machine gun was fitted in a ball mount in front of the radio-operator, as had been done on late model LVT(A)-1s. While this step had been taken prior to the Marianas campaign, it still was considered as part of this modification.

These additional machine guns greatly reduced the vehicle's vunerability. Unfortunately, it took time to implement these changes and while awaiting delivery of the new LVT(A)-4s, many early LVT(A)-4s were modified by their crews to increase their firepower. Some crews mounted additional .30 caliber machine guns in the turret and added armor

LVT (A)-1



LVT (A)-4

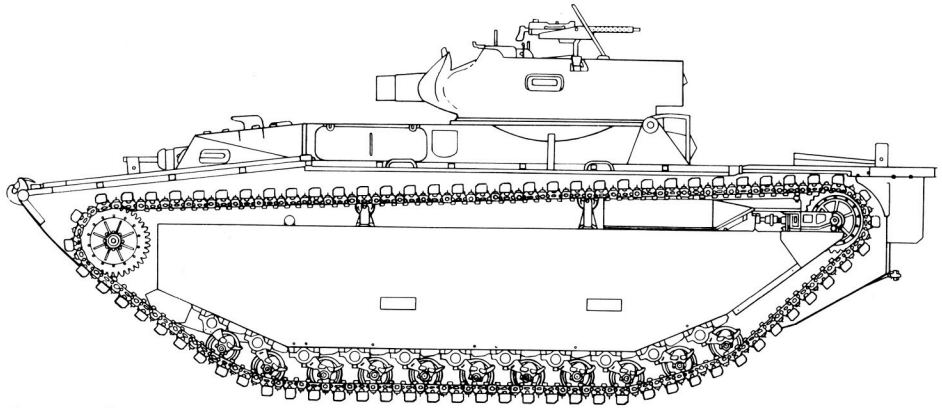


shields to the rear .50 caliber gun mount. Additional armor shields were also fitted to the forward portion of the turret to give the crews extra protection. These changes considerably enhanced the LVT(A)-4s overall firepower and protection until the factory modifications became standard. The end result was a much improved vehicle which gave the crew a far better chance for survival in the combat zone.

Production of the LVT(A)-4 began in 1944 and during that year 1,489 vehicles were produced. An additional 401 were manufactured in 1945 before production shifted to a newer version, the LVT(A)-5. Of these, 533 were obtained by the Marines and equipped three AMTANK battalions while the Army formed seven AMTANK battalions with the 1,307 LVT(A)-4s they received. An additional fifty vehicles were supplied under Lend-Lease to U. S. Allies.

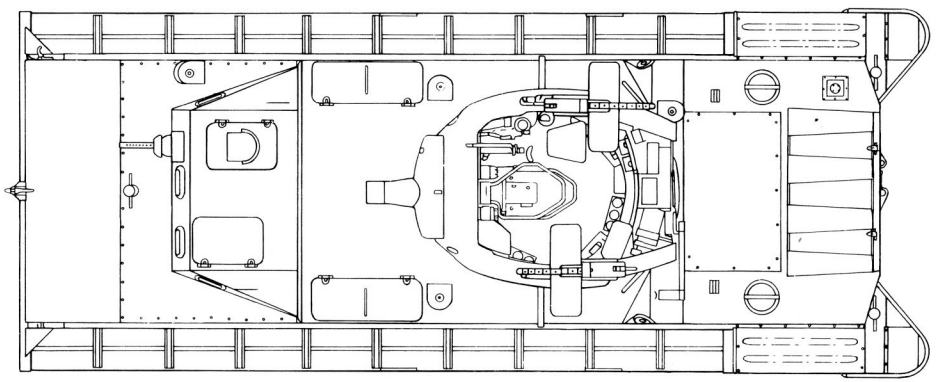
Early vehicles, like this early production LVT(A)-4 undergoing swim tests, had plastic bubbles over the periscopes but these fogged over and blocked the driver and his assistant's vision, so they were deleted. The turrets were fitted with holders for track grousers as used on the M8 HMC but these were later eliminated as the LVT(A)-4 never used them. (FMC)

One of the problems which quickly surfaced in combat was the lack of close-in protective fire which the LVT(A)-4 could provide for itself. While the .50 caliber machine gun was available, the gunner was fully exposed in order to bring the weapon to bear against ground targets.



Specifications

LVT(A)-4

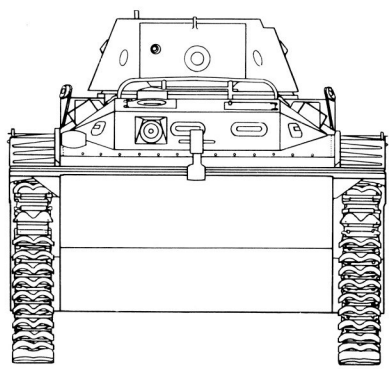


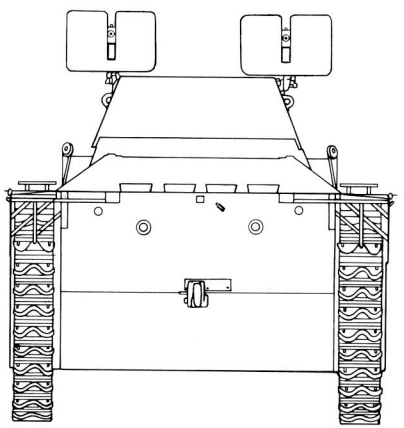
Crew ..... Six

Length ..... 26 feet 2 inches (7.9m)
Width ..... 10 feet 8 inches (3.25m)
Height ..... 10 feet 2.5 inches (3.09m)
Weight ..... 41,000 pounds (18,597 kg)

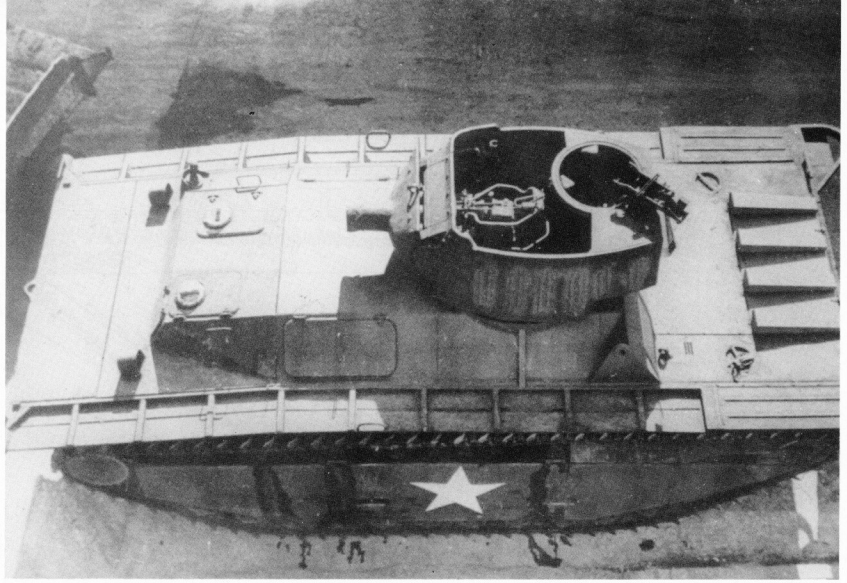
Armament
Main ..... One 75MM howitzer
Secondary ..... Three .30 caliber machine guns

Engine ..... One 250 hp Continental engine
Speed ..... 16 mph/25.74 kmh (land)
7 mph/11.26 kmh (water)
Range ..... 300 miles/482.79 km (land)
200 miles/321.86 km (water)





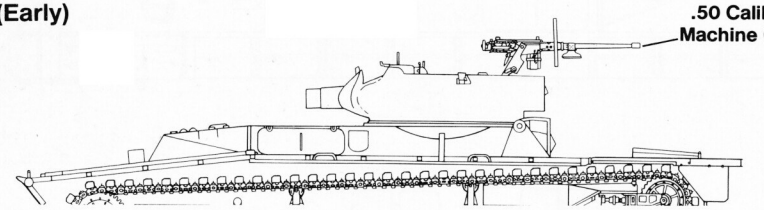
To augment the LVT(A)-4s firepower, a bow mounted .30 caliber machine gun was added for use by the assistant driver. This early model still retains the plastic bubbles over the periscopes but the racks for the track grousers on the turret side have been eliminated. (Hunnicutt)



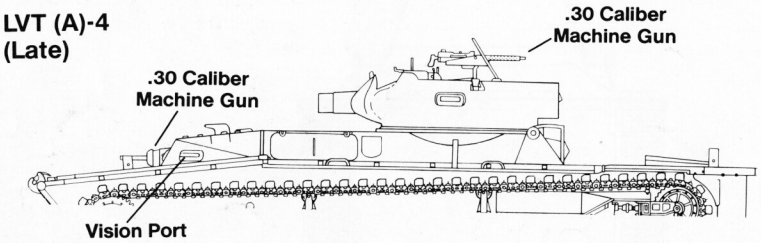
The M8 HMC turret was fitted with a ring mounted .50 caliber machine gun at the rear of the turret. This single gun along with the open turret was to prove to be a problem in close in fighting. The engine ports have been fitted with armored louvers. (Patton Museum)

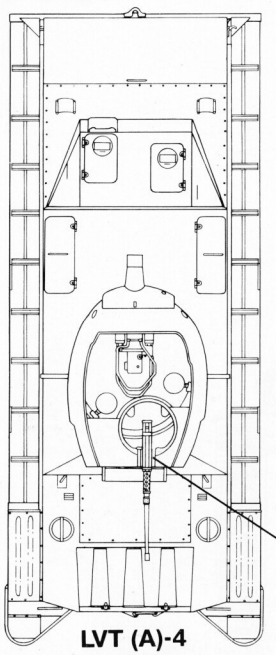
"Marianas Model"

LVT (A)-4 (Early)

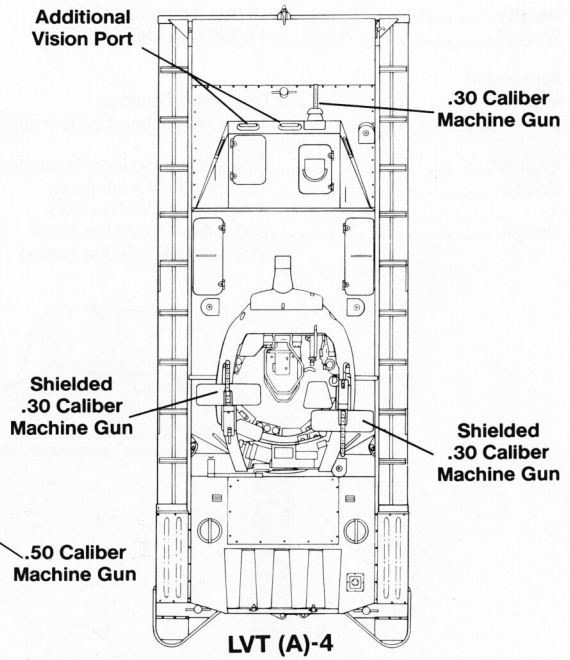


LVT (A)-4 (Late)





LVT (A)-4 (Early)



LVT (A)-4 (Late)

LVT(A)-5

One of the main problems with the LVT(A)-4, aside from its limited defensive firepower, was its inability to fire accurately while on the move due its lack of a gyro stabilizer. This was not a major problem when on land, as the vehicle was generally stationary when it fired, but when leading assault waves the constant bobbing in the water made accuracy impossible. Starting in 1945, production of an improved variant, the LVT(A)-5, was begun. This variant incorporated the basic "Marianas Model" changes consisting of the bow machine gun and pintel mounts in the turret for .30 caliber machine guns to replace the .50 caliber machine gun. In addition, power traverse was added to the turret and a gyro-stabilizer system was fitted to the 75MM howitzer. A turret basket was also added to allow the crew to work more efficiently in the power operated turret. Other improvements such as additional version blocks (found on late model LVT(A)-4s) were carried over to the LVT(A)-5 series. In fact, only close scrutiny could tell the difference between the two models. A total of 269 LVT(A)-5s were produced at FMC's Riverside, California plant in 1945 before production ceased due to the end of the war.

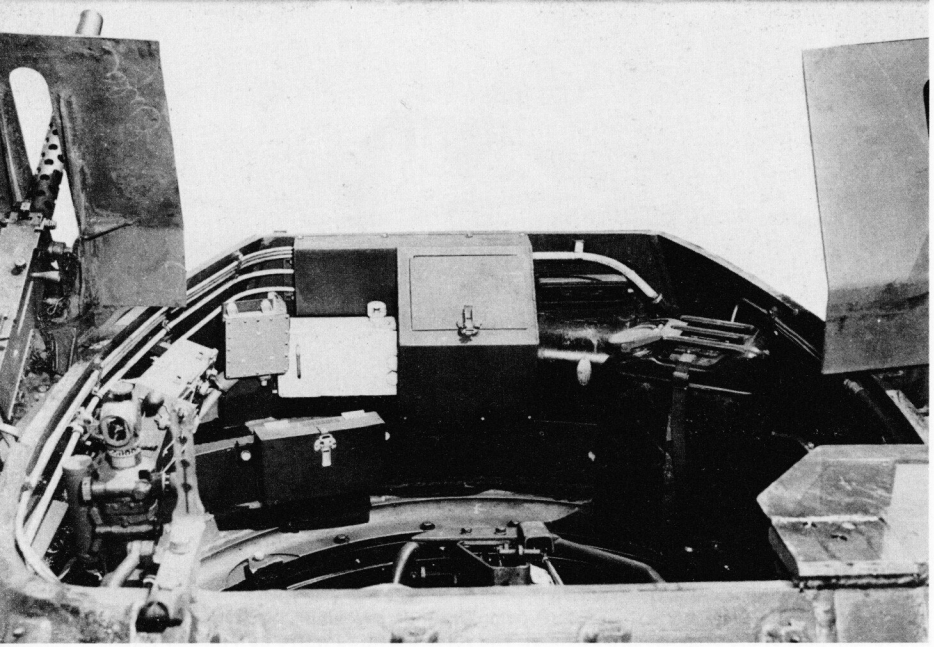
Following the end of the war, many LVT(A)-5s were put into storage and in 1949 a small number of these vehicles were extensively modified under a modernization program. A new rounded bow was added which gave the LVT better handling qualities in the water and greater buoyancy. The superstructure was extended forward to tie in with the new bow which led to the elimination of the bow machine gun. A new cupola with all-round vision was provided for the driver, with a rear folding hatch. Due to the increased height of the drivers position, the clutch had to be extended. The rear part of the superstructure was also extended back over the engine deck to provide for better cooling and protection from flooding.

One problem which the LVT(A)-4 had was its inability to fire while on the move. To alleviate this problem the 75MM howitzer was fitted with an elevation stabilizer and the turret was fitted with power traverse. These changes led to the vehicle being designated as the LVT(A)-5. (FMC)

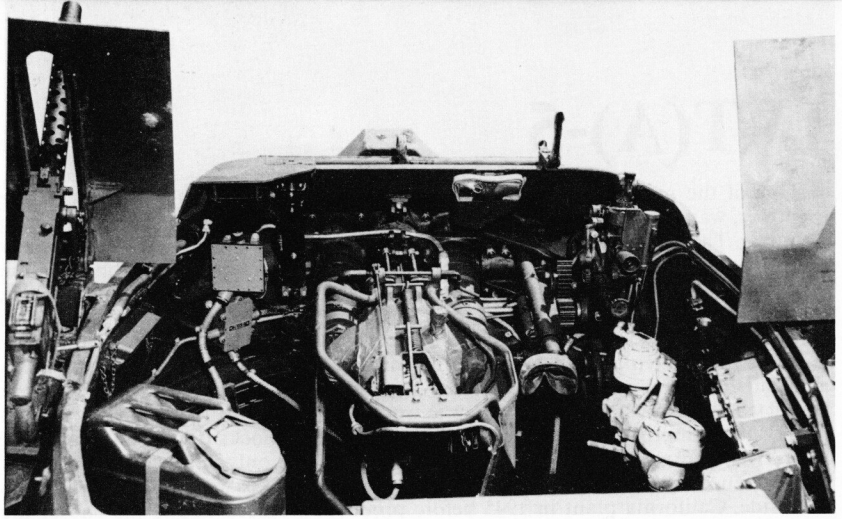
This Army LVT(A)-5, probably at Aberdeen Proving Grounds, reveals all the changes made to this variant (last of the original AMTANK line). The vehicle is fitted with a bow machine gun, vision ports on the turret and upper hull, .30 caliber machine guns on the turret and a barrel counterweight on the 75MM howitzer fitted with the stabilizing mechanism. (Patton Museum)

The M8 HMC turret was modified with raised sides, more vision blocks and an overhead cover with a single hatch. New hatches were added to the side sponsons which went through the pontoons directly into the hull. Additional rails were also added along the top of the vehicle. The exact number of vehicles which were modified to this configuration is unknown but those that were modernized were redesignated as LVT(A)-5 Modified, although the designation LVT(A)-6 was used initially to refer to the vehicle. These eventually saw combat in Korea, mainly as mobile artillery, firing from sandbagged and dug-in positions. Following the Korean War they were retired and either scrapped or put into storage.

To improve visibility, vision blocks were added to the drivers compartment and turret. In particular, these vision blocks gave the turret crew more protection since they did not have to raise their heads up over the turret to see around them. (Hunnicutt)

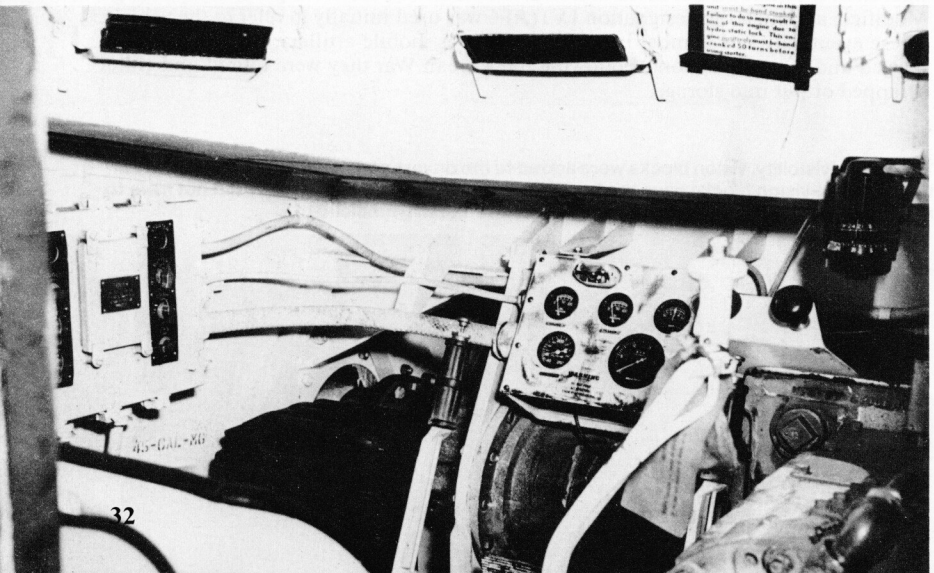


The rear of the turret was used to store a variety of gear including ammunition and a jerry can. The partial cover found on the early LVT(A)-4 has been totally done away with. Shielded .30 caliber machine guns were carried on both sides of the turret. (Hunnicutt)

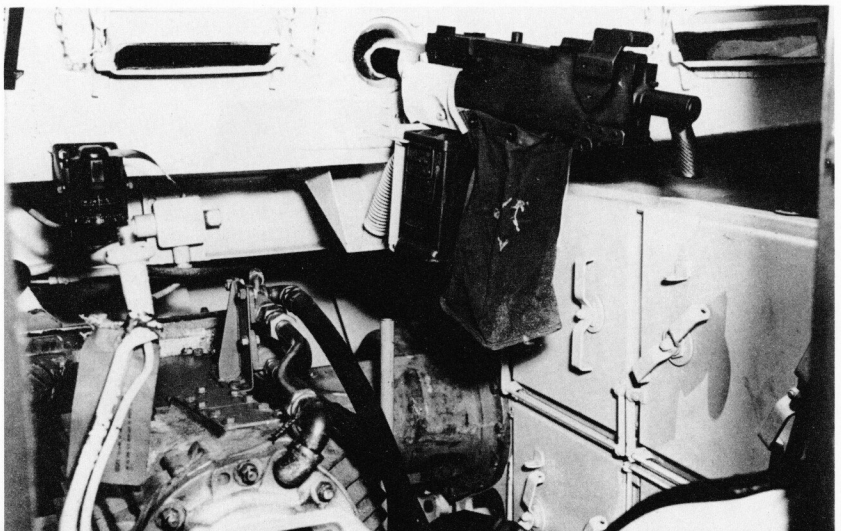


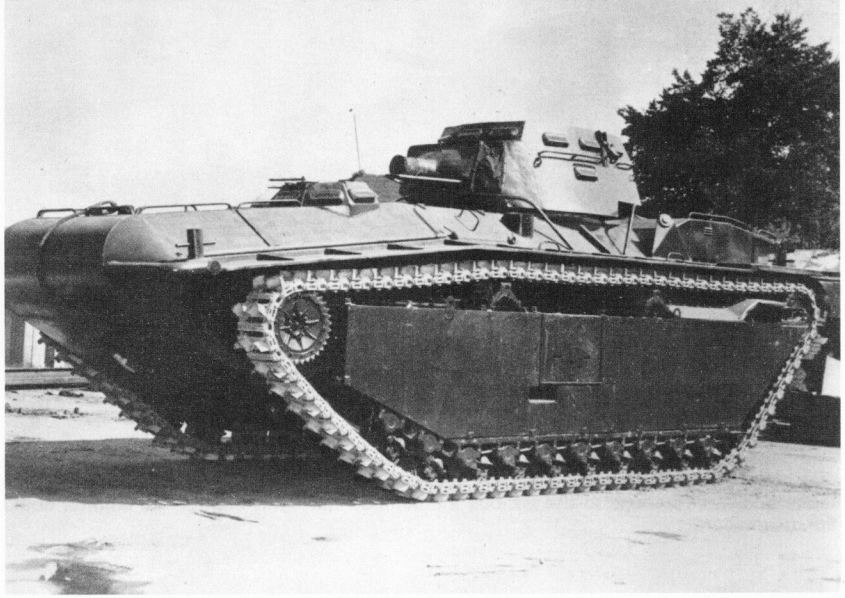
While the early LVT(A)-4 turret was relatively uncluttered, the modifications made to the LVT(A)-5 made for a tight-fitting interior. The forward part of the turret had the breach of the 75MM howitzer in the center, along with various sighting and stabilization mechanisms on either side. (Hunnicutt)

Aside from minor changes, the driver's and assistant driver's compartments remained relatively unchanged from the LVT-2, LVT(A)-4 and LVT(A)-5. The interior of the drivers compartment of the LVT(A)-5 had prominent vision blocks. (Hunnicutt)



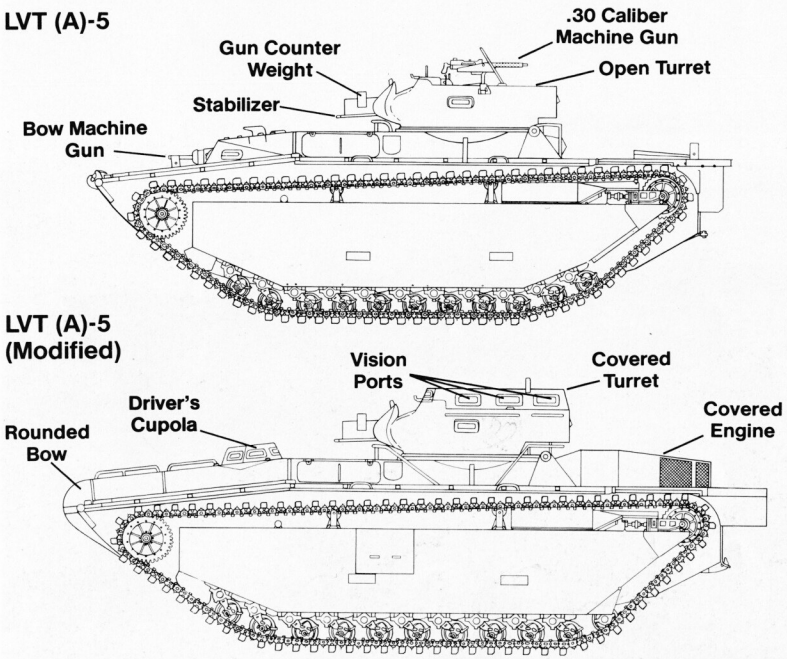
The assistant driver's compartment was fitted with a .30 caliber bow machine gun and a bag to collect the loose brass. The object in the lower corner is part of the transmission assembly. (Hunnicutt)





Just prior to the start of the Korean War, a number of LVT(A)-5s were modified to increase their combat effectiveness. A rounded bow was added and the upper deck was extended both fore and aft. A new drivers cupola was added, the sides of the turret were raised and a roof installed. New hatches were also added to the side pontoons for easier access. (FMC)

The M8 HMC turret's sides were raised and a roof was added for additional crew protection. Nine vision blocks were added around the top extension along with a single hatch for entry, escape or observation. (Lundh)



The rear deck was also covered over to provide protection against water entering the engine exhausts. Hatches on top of the roof allowed access to the engine compartment. Hatches were provided on both sides of the sponsons for access to the hull through the pontoons. (Lundh)

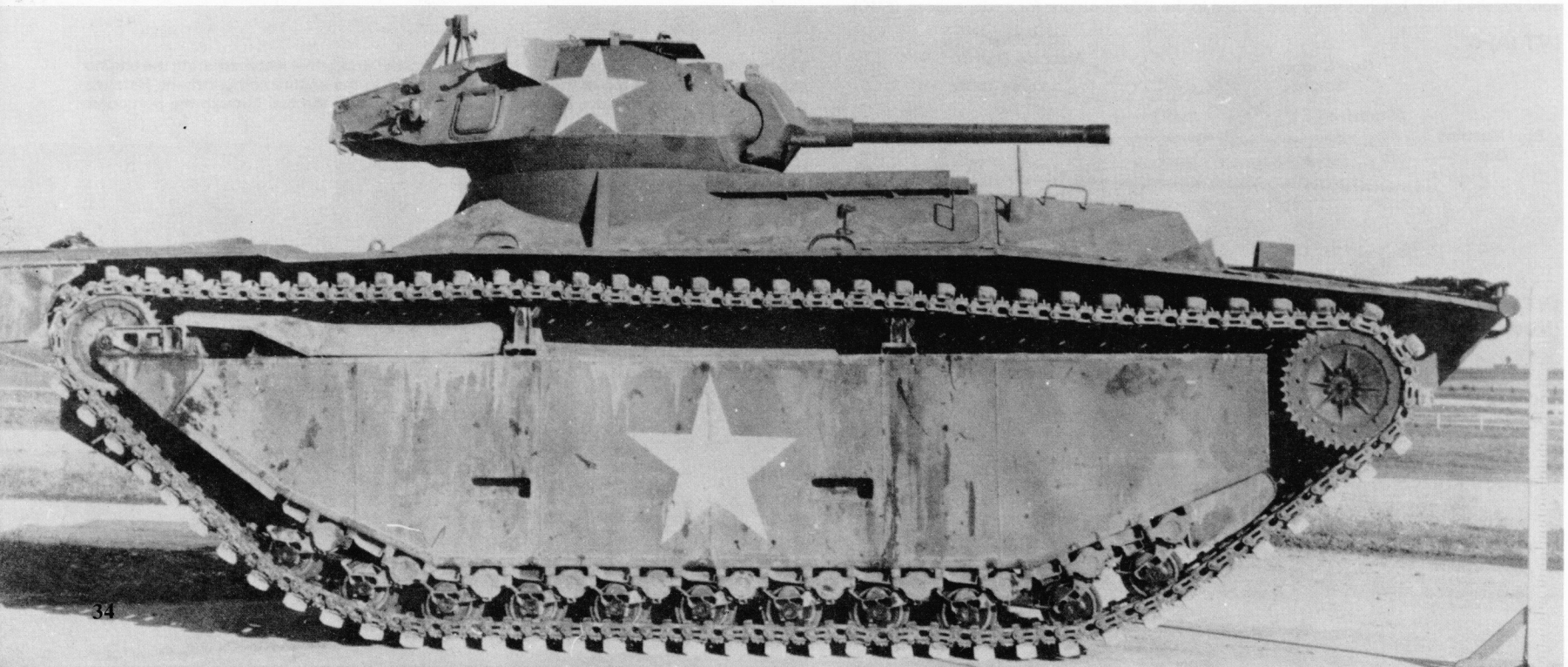
LVT(A)-1/M24 Turret

In June of 1944, the Army requested that an LVT(A)-1 be fitted with the turret from a M24 Chaffee light tank to increase the vehicle's firepower. To handle the additional weight, the transmission and drive train were beefed up and internal modifications were made to accomodate the M24's turret mechanism. Externally, the turret ring was enlarged to sixty inches and strengthened to support the extra weight. Tests on the modified vehicle showed that it was unstable while maneuvering in the water though the gun could be safely fired.

As a result, it was recommended that the hull be reduced in height by nine inches and that the turret be modified by reducing its weight and moving it forward two inches. Unfortunately, the war ended before this could be done, and the project was dropped. In light of the performance of the M24's 75MM gun and its wide variety of ammunition, this modification might have proved to be a very interesting development of the AMTANK and perhaps it would have performed better than the LVT(A)-4 series did.

Another attempt at increasing the armament of the LVT was the installation of an M24 light tank turret on an LVT(A)-1 hull. This gave the AMTANK a gun which could engage both enemy tanks and bunkers due to the various ammunition the lightweight 75MM cannon could fire. (Hunnicutt)

While the overall height increase was not that great with the turret fitted, the extra weight required some modifications to the transmission and final drive to compensate for the increase. The turret could be fitted with a .50 caliber machine gun on the mount at the rear of the turret. (Hunnicutt)



Into Service

When the Navy accepted the LVT-1, production began immediately at FMC's Riverside, California plant, with the first AMTRAC coming off the production line in July of 1941. In order to train new personnel in the vehicles use, a small amphibious tractor detachment was formed at Quantico, Virginia under MAJ W. Davies, which then moved to Dunedin, Florida to set up a training center. As new LVT-1s came off the assembly lines at Riverside and FMC's Lakeland plant, they were sent to Dunedin where crews were trained in their use and maintenance. These crews were then sent the 1st Amphibious Tractor Battalion of the 1st Marine Division, which reached full strength in February of 1942, just two months after the Japansese attack on Pearl Harbor.

Within a few months, the unit was committed to combat when the 1st Marine Division carried out the first offensive ground attack by U. S. forces in August of 1942 when it stormed ashore at Guadalcanal. Initially, the LVT-1 was only intended to carry troops or cargo over coral reefs, but at Guadalcanal it was used to move supplies inland and to support ground units. Elements of the battalion were also used to man part of the perimeter defending Hendrson Field, the focus of the battle. While some maintenance problems arose, overall the performance of the LVT-1 proved the worth of the AMTRAC concept and spurred future development.

Even as the battle for Guadalcanal went on, halfway around the world the LVT was taking part in its second campaign. In November, Marine LVTs from the Fleet Marine Force, Atlantic, carried Army troops ashore against French positions in North Africa during Operation TORCH and encountered no serious problems. Following the successful use of LVTs in these two actions, they were then employed in the invasion of the Aleution Islands during the spring and summer of 1943, at Redova in September of that year and for the Bourganville invasion in November. During each of these assaults, there was little resistance at the beachhead, so while the AMTRACs had proven their worth as troop and cargo carriers, they had yet to be really tested under direct fire during an amphibious invasion. This, however, was to soon change dramatically at a small atoll in the central Pacific called Tarawa.

Following the victory at Guadalcanal, U.S. forces moved further up the Solomon Island chain toward Rabaul. These Marines fill jerry cans from a fuel bladder in an LVT-1 for distribution to field units. The LVTs proved invaluable in the wet muddy jungle conditions for moving supplies off the beaches. (National Archives)

The AMTRAC was first used at Guadalcanal where LVT-1s of the 1st and 2nd Amphibious Tractor Battalions were used to bring troops and supplies ashore. This LVT was used in the initial assault and was armed with a water cooled .30 caliber machine gun next to the .50 caliber machine gun on the forward mounts. (FMC)

Along with use in the South Pacific, AMTRACs were also used in the Northern Pacific during the invasion of Aluetian Islands in early 1943. These LVT-1s move ashore at Kiska during a supply run following the unopposed recapture of the island. (National Archives)

This AMTRAC moves forward through a patch of jungle on the island of New Georgia. This is a late production variant of the LVT-1 identified by the closer spacing of the driver's windows. (National Archives)

A group of LVT-1s and LVT-2s await orders to move out on a beach in the northern Solomons. The newer and far superior LVT-2s gradually replaced the early LVT-1s since, in the early stages of the war, production could not keep up with the demands from the field. (National Archives)

Bloody Tarawa

By the Fall of 1943, the U. S. had shifted its offensive against Japan into high gear. A new line of advance across the central Pacific was about to begin, aimed at a small coral atoll called Tarawa. Coral atolls were basically small islands surrounded by a coral reef which often did not allow enough clearance for regular landing craft to get over them. This type of situation was exactly suited to the characteristics of the LVT. Additionally, due to their small size, the atolls offered only limited areas for landings to take place which the entrenched Japanese could easily defend.

When Betio Island in the Tarawa atoll was selected for invasion, the coral reef which surrounded it was viewed with great skepticism by Marine planners. They wanted to use AMTRACs for the initial assault but were opposed by Navy officers. In the end, the Marine commander, GEN Holland Smith told his Navy counterpart, ADM Kelly Turner, that if AMTRACs were not used, there would be no invasion. Unfortunately, the only AMTRACs available were 100 LVT-1s of the 2nd Amphibious Tractor Battalion which were in very poor condition after the Guadalcanal campaign. Eventually, seventy-five of these were reconditioned but more were needed. An additional fifty LVT-2s were finally located and formed into a new company to support the invasion.

Due to a warning from the 2nd Marine Division Commander, GEN Julian Smith, to expect heavy enemy fire, the tractor battalion commander, MAJ Henry Drewes had makeshift armor plating fitted to the AMTRACs. In New Zealand the LVT-1s had quarter inch armor plates attached to the front and sides of the cab, along with an additional square plate mounted inside to protect the driver. In Samoa, the LVT-2s were fitted with a twenty-six by forty inch piece of 3/8 inch boiler plate to the front of the cab for added protection.

To help suppress enemy fire near the beach, the armament of the AMTRACs was beefed up. The LVT-1s were fitted with two .50 caliber machine guns in front and a .30 caliber gun at the rear. A single .50 caliber along with a .30 caliber gun were fitted up front

The first real test of the AMTRAC as a combat weapon took place in November of 1943 when the 2nd Marine Division assaulted the island of Betio in the Tarawa Atoll. During the three day invasion, the dug-in Japanese extracted a heavy toll of the attacking Marines from their bunkers. Due to the tides, the only way to get over the reef around Betio was by LVT but the heavy enemy fire knocked out many of the thinned skinned vehicles. These two AMTRACs lie abandoned next to the sea wall at the end of the battle. (Hunnicutt)

on the LVT-2s along with a single .30 caliber at the rear. Prior to the invasion some changes were made in the gun arrangement which were to be used by the embarked troops. Grappling hooks were also fitted to pull up barbed wire as the AMTRACs crossed the beaches. While these modifications made the AMTRACs more combat effective, the additional weight made them slower in the water, which would expose them to enemy fire for a longer period of time.

On 20 November 1943, 100 AMTRACs in three waves began to crawl toward tiny Betio Island. The coral reef was easily crossed by the AMTRACs, but there was not enough water over the reef for the LCVPs to cross, something the Marines had feared all along. As the AMTRACs neared the beach all hell broke loose. Very few of the Japanese emplacements had been neutralized and a withering barrage of artillery, mortar, machine gun and rifle fire hit the LVTs. At least eight AMTRACs were knocked out from the first wave, although four managed to get ashore and move inland before disembarking their Marines. As the troops were dropped off, the LVTs backed off the beach to take advantage of their armor before returning for more men.

During the initial return, at least fifteen AMTRACs sank due to the numerous holes in their hulls. Those that got back to the reef picked up more Marines from the stranded landing craft, but as the number of LVTs dwindled, the majority of Marines were forced to wade between 500 to 800 yards through heavy enemy fire to get ashore. Casualties were heavy as the Japanese zeroed in on the helpless men. More AMTRACs were hit or disabled, further diminishing the already small number still operating. For three days the fighting continued and by the end the courage and tenacity of the Marines won out and Betio fell.

The cost, however, had been high. Over 3000 Marines were casualties including 1000 dead, while on the Japanese side nearly 4,700 perished in the bitter three day struggle. For the 2nd Amphibious Tractor Battalion, Tarawa had been a blood letting. Out of the 125 AMTRACs which had taken part in the attack, only thirty-five were in running order at the end of the battle. Of the remaining ninety, sixty-one sank in the ocean, lagoon or along the reef, nine were burned out by gas tank fires, eight had mechanical failure and twelve were destroyed on the beach by mines or gunfire. Personnel losses were equally as heavy. Out of 500 men, 323 were either killed, wounded, or missing, a casualty rate of sixty-five percent.

Yet the sacrifices of the AMTRAC battalion were not in vain, for had the Marines been forced to rely on regular landing craft it is highly probable that the invasion would have been a bloody debacle. The LVTs were the difference between a defeat and victory.

Six knocked out LVT-1s and LVT-2s rest in the Betio Lagoon after the battle. The high cost of the battle was evident by the numerous bodies floating in the water. The LVT-1 in the background was knocked out as it attempted to climb the sea wall to carry Marines inland from the beach on the first day of the battle. (USMC via Cressman)

At the end of the battle only thirty-five of the 125 LVT-1s and LVT-2s were still in action. A few of these move supplies ashore as Marines clean up the beach area and set up positions and supply points. Without the LVTs it is highly doubtful that the Marines would have been able to secure the island. (National Archives)

Toward Japan

The bloodshed at Tarawa shocked the American people by exposing them to the realities of war. It also brought about revisions in the tactical employment of LVTs for future landings. Henceforth, AMTRACs would play a far more important role than in previous amphibious assaults and in recognition of this new and vitally important role, production of amphibious vehicles was substantially increased.

Following Tarawa, the next major amphibious operation was carried out against Kwajalein and Roi-Namur in the Marshall Islands in February of 1944. Both Army and Marine AMTRAC units were employed during the attack, which saw the first employment of the LVT(A)-1 in combat. Great care was taken not to repeat the errors of Tarawa. Due to careful planning, the invasion was carried out with few major problems. In support of the AMTRACs, light and medium tanks were brought ashore quickly to support the ground units. Both the LVT(A)-1's and M5's 37MM cannon proved ineffective against the well-built Japanese bunkers but the 75MM cannon on the M4 Sherman proved more than adequate for the job.

Due to the lack of hitting power, both the AMTRACs and M5s were relegated to secondary roles during the follow up invasions of Ergebi and Eniwetok where M4s provided the main fire support for the ground troops. These lessons greatly influenced the future employment of the more heavily armed LVT(A)-4 which was shortly to come into service. Since the light armor and small gun on the LVT(A)-1 precluded its being used in direct support of the infantry, the M4 became the weapon of choice for this role. Gradually, the AMTRACs were shifted to providing indirect fire support once the beachhead had been secured.

As the U. S. drive across the Central Pacific got into high gear, the numbers of amphibious tractor and tank units increased accordingly. During the invasion of the Marianas in the Summer of 1944, the Army and Marines used the largest number of AMTRACs and AMTANKs yet employed in the Pacific. This invasion also saw the introduction of the new LVT-4 and LVT(A)-4 into service. The LVT-4 was especially well received since its rear ramp allowed easier unloading and a greater variety of cargo to be carried. However, the LVT(A)-4 presented a mixed blessing to the units using it. On one hand, its heavier gun was much more effective than the 37MM cannon of the LVT(A)-1. On the other hand, its open top was a severe liability in dense jungle where the Japanese were hidden.

In addition, its single .50 caliber machine gun mounted on top of the turret exposed the gunner to enemy fire and was cumbersome to operate in situations where speed was essential. The deletion of the rear gun tubs as found on the LVT(A)-1 was considered by many a step backwards in AMTRAC design and severely restricted the LVT(A)-4s' ability to defend itself. A number of them were lost during the campaign in close-in fighting. As a result of these lessons, more machine guns were added as well as field modifications for protection of the gunner. While some of these changes were already being implemented on the production lines, it would be some time before the new models reached the Pacific so many modifications were made by the troops in the field.

Following the Marianas campaign, LVTs were used at Peleliu and in the invasion of the Philippines. Peliliu, often compared to Tarawa, was a costly battle in which AMTRACs and AMTANKs played a critical role. Due to previous experience, more emphasis was placed on tanks for infantry support once the beaches were secured and the AMTANKS were quickly relegated for indirect fire support as mobile artillery. In the Philippines, the LVTs were used solely for logistical support since the Japanese had decided to fight further inland. They were also employed in their longest campaign, participating in numerous landings well into the early part of 1945.

While the Marines were taking Betio, Butaritari Island in the Makin Atoll group was assaulted by U. S. Army troops against far less opposition. This LVT-2 was used to haul supplies ashore at low tide from LSTs off Yellow Beach. This invasion was far less costly since there were fewer Japanese defenders in lighter fortifications compared to Tarawa. (USN via Cressman)

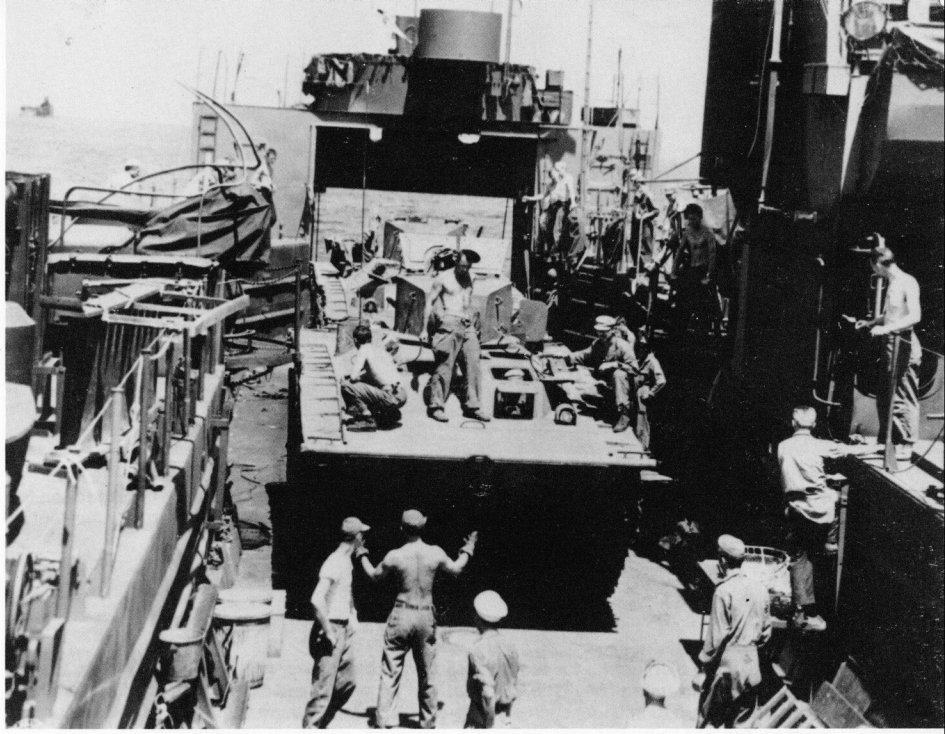
In early 1945, the Marines carried out their bloodiest assault of the war against the island of Iwo Jima, only 600 miles from the Japanese mainland. While Iwo did not have a coral reef around it, the volcanic sand which made up its soil was very loose and not conducive to wheeled vehicles. Because of this, invasion planners intended to use AMTRACs extensively for logistical support once the beachhead was secured. In addition, heavy Japanese resistance was expected and the planners foresaw LVTs as instrumental in getting the troops ashore and providing initial fire support.

On 19 February, the Marines began the bloodiest battle in their history when AMTRACs and AMTANKs churned through the choppy sea toward Iwo Jima, hidden under a pall of gunfire, smoke and dust. Initial Japanese resistance was light, but quickly stiffened. The loose volcanic sand and steep slope to the beach severely restricted inland movement and, in some cases, particularly in the 5th Marine Divisions area, the LVTs could not even get off the beach. Congestion became a serious problem and the beaches were soon a jumbled mass of vehicles, LVTs, supplies and debris. Eventually, order was restored and the AMTRACs began shuttling supplies inland while AMTANKs gave fire support. Some AMTANKs were even used to suppress enemy fire from offshore but the ocean swells threw their arm off and made accurate shooting impossible without gyrostabilizers and this use was quickly dropped when it endangered friendly troops. Due to the large number of M4 medium tanks which were quickly brought ashore, the AMTANKs were quickly pulled out of the direct support role as the tanks heavier armor made them better suited for this role. By the end of the campaign on 20 March 1945, the LVTs had proved to be indispensable, moving men and supplies ashore and inland under the most trying of conditions. Without their help, the struggle for the island would have taken far longer and been much more costly.

With Iwo Jima secured, the next and, as it turned out, last amphibious assault of the Pacific War took place on 1 April when Marines and soldiers stormed ashore on Okinawa. This invasion saw the debut of the new LVT-3 and newer models of the LVT(A)-4. Okinawa differed greatly from most of the other invasions in a number of ways. The Japanese did not contest the landings and, in fact, decided to contest only the southern half of the island. Due to the rolling terrain of the island, the AMTRACs and AMTANKs were used to carry troops much as mechanized units used their armored personnel carriers (APCs).

Throughout the campaign, the LVTs played an important role in the fighting. After their easy drive north, the Marines turned south to help the Army which had run into the main Japanese defensive line. The LVT(A)-4s were employed as self-propelled artillery while the various AMTRACs hauled men and material through the muddy terrain when the rains turned the ground into a quagmire in late May. In early June, the 1st Marine Division used their LVTs to carry out a shore-to-shore assault against the Oruku Peninsula, near the city of Haha, in one of the closing attacks of the campaign. With this drive complete, the end of fighting was in sight, and on 21 June the island was declared secure.

In retrospect, the LVT was undoubtedly one of the key weapons developed for use in the Second World War in the Pacific. Had they not existed, it is doubtful whether the string of successful amphibious invasions would have been possible. As such they were one of the decisive weapons in the war against Japan and as the war went along, new innovations and designs improved their effectiveness tremendously, allowing the U. S. to seize the key islands which were used as bases to bomb Japan into submission.



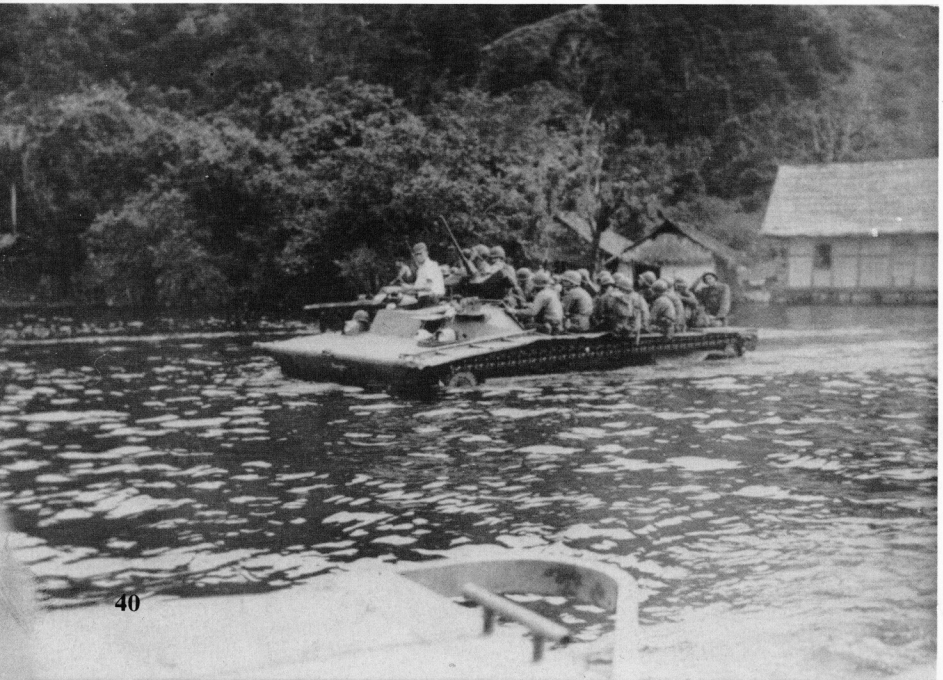
LVT(A)-1s began arriving in the Pacific shortly after the invasion of Tarawa. Two early production LVT(A)-1s are being loaded onto an Landing Craft Infantry (LCI) for transportation to the front. (FMC)

Lessons learned at Tarawa helped change amphibious tactics and were incorporated to future planning. As a result, the invasion of the Kwajalein Atoll went off without major problems and with far fewer casualties. These Marines of the Fourth Marine Division disembarked from an LVT-2 armed with four machine guns at Namur Island which was secured in one day. (USN via Cressman)

Troops move toward the line of departure during the invasion of the Marianas in the Summer of 1944. The LVT-2 was fitted with curved gun shields to provide a measure of protection for the gunners. In an effort to increase protection, the crew has added sandbags to the front of the AMTRAC. (FMC)

A number of different types of gun shields were used on LVT gun mounts, some of which came from the factory and some of which were field modifications. This LVT-2 has been fitted with flat shields. While the shields did provide protection many felt this was more of a psychological effect than an actual one. (National Archives)

AMTRACs were also useful for ferrying troops across rivers. An army LVT-2 moves troops across Lake Santeuri in New Guinea. The LVTs provided field commanders with a valuable means of transportation under such conditions which allowed them to move men and equipment in areas thought to be impassable by the Japanese. (National Archives)



Besides being used in the logistics role, some AMTRACs were used to provide fire support for front line units. This LVT-2 was fitted with a 37MM cannon taken from a P-39 Airacobra and rocket projectors by the 2nd Engineer Special Brigade Support Battery. (Hunnicutt)

Troops watch as a late production LVT(A)-1 moves through a palm grove on Moratai in mid-September of 1944. This AMTANK has the newer engine louver covers but does not have the raised shields around the rear of the gun tubs. In dense jungle like this, these gun positions were very important. (Hunnicutt)

AMTRACs played a very important role in the recapture of the Philippines. These LVT-4s have just moved into the town of Binnmeley on Luzon and the troops have taken a break to talk with the towns people. The primitive road conditions throughout the Philippines made it difficult to move men and supplies, particularly in the rainy season, and LVTs played a vital role in keeping troops supplied and mobile. (National Archives)

LADY LUCK, an LVT(A)-4 of the Marine 3rd Armored Amphibious Battalion, rammed this Japanese gun on Peleliu during the initial landings on 15 September 1944. The lack of the rear gun tubs meant that the turret mounted .50 caliber machine gun was the main defense against ground troops but the high mount exposed the gunner and severely restricted the vehicle's ability to defend itself against a determined attack. (Hunnicutt)

The crew of this LVT-4 unload supplies on Leyte after the initial capture of the beachhead. The muddy conditions are quite evident and such conditions would have made movement by wheeled vehicles all but impossible. (National Archives)

One of the toughest battles of the Pacific War was the invasion of Iwo Jima by three Marine divisions in February of 1945. This LVT(A)-4 was being lifted over the side as its crew boards in preparation for the invasion. In order to provide more protection for the machine gunner, a tub, similar to that used on the LVT(A)-1, was fitted to the gun position. (National Archives)

Marines unload cargo from AMTRACs on the beaches of Iwo Jima on the third day of the battle. This LVT appears to carry the Green, Tan, and Red-Brown color scheme used on some vehicles at Iwo and has circular armored shields for the gun mounts. (Hunnicutt)

The soft volcanic ash on Iwo Jima made for difficult going and heavy enemy fire took its toll of the AMTRACs as they struggled ashore and up the terraced slopes off the beach and a number of LVTs became mired in the sand. The three LVTs in the foreground all have curved gun shields. (National Archives)

LVT(A)-4s, fitted with extra armor on the front of the gun turrets and carrying sand bags for added protection, move toward Red Beach on Okinawa on 1 April 1945. The AMTANKs belong to Company "A," First Armored Amphibious Tractor Battalion, Fourth Marine Division. (USN via Cressman)

Marines use a beached Japanese freighter on Iwo Jima as a shelter as they work on an LVT(A)-4, an LVT-2 and an LVT-4. The LVT(A)-4 carries a modified gun tub on the turret similar to the type used on the earlier LVT(A)-1. (USN via Cressman)

An LVT(A)-1 attached to the 77th Infantry Division supports troops in dense jungle on Okinawa during the largest amphibious invasion of the Pacific War. The female art work on the side of the turret is unusual for an LVT. Most, if anything, usually carried just a name. (National Archives)

A column of LVT(A)-4s carry Marines across the rolling Okinawa countryside during the later stages of the campaign. The size of Okinawa allowed amphibious vehicles to be used to a larger extent in the mechanized role, serving as APCs and fire support vehicles. (Hunnicutt)

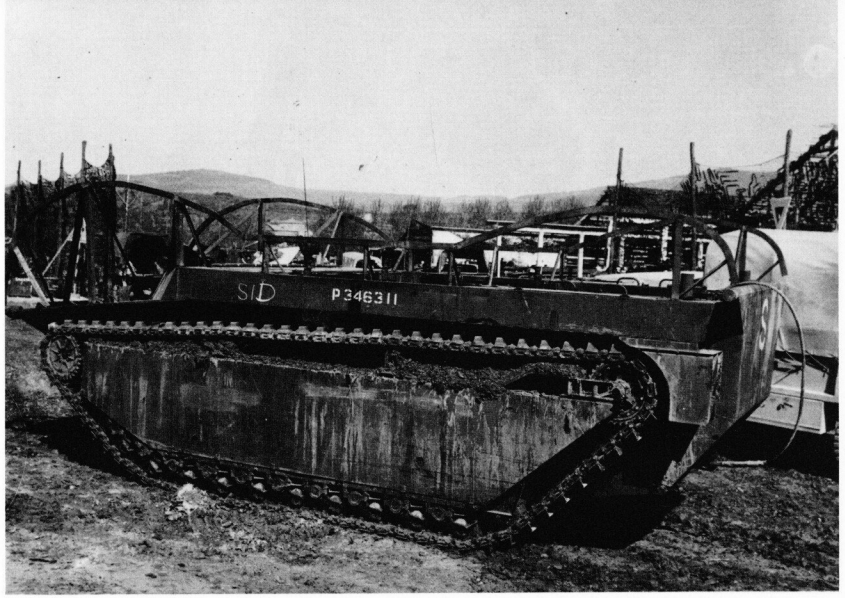
AMTRACs were also used by Allied forces in the Pacific under Lend-Lease. Australian troops supported by LVT-4s move forward on the island of Muaia in the Dutch East Indies during the Spring of 1945. These LVT-4s lack shields on the machine guns. (National Archives)

Europe

LVTs saw far less use in Europe than in the Pacific following their initial use in North Africa. They were not employed during the various invasions which took place in Italy and France due to a number of reasons, foremost of which was that the Pacific Theater had priority in receiving AMTRACs. In the European Theater, LVT deliveries had not become available until late in the Summer of 1944, with many of them going to the British. A large number of these LVT-2s and LVT-4s were assigned to the 79th Armored Division, the unit which employed a wide variety of specialized vehicles. Some of the AMTRACs were modified to carry 6 pounder anti-tank guns, a few were fitted to lay mats over muddy terrain, while some were outfitted with two flamethrowers and their related equipment under the designation Sea Serpent. These specialized vehicles were used in conjunction with conventional LVTs primarily for river crossing operations, such as the attacks on the Rhine and Po rivers in the Spring of 1945. They were also used to help secure the approaches to Antwerp in the late Fall of 1944 against German held islands in the Scheldt Estwary.

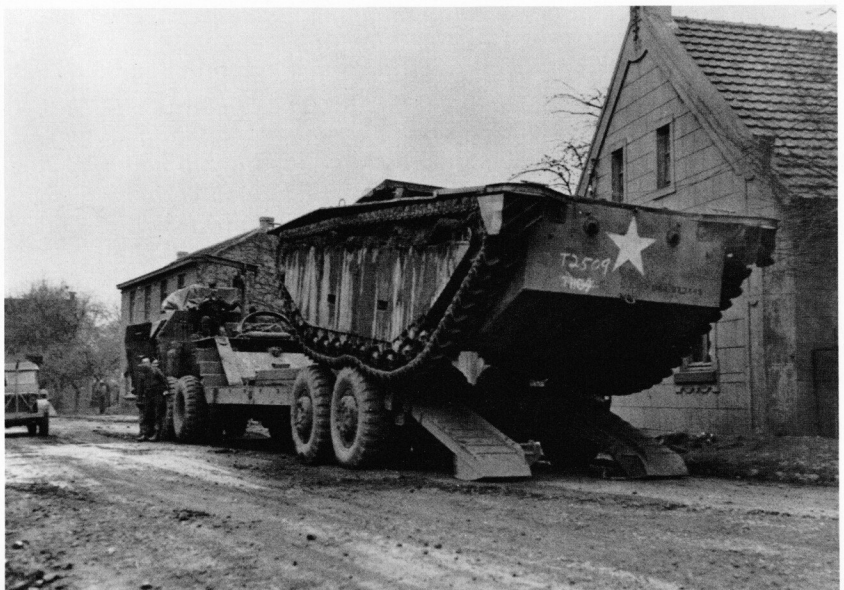
The U.S. Army used AMTRACs in relatively small numbers, primarily like the British, for river crossings. They were not used in the various invasions against the European continent, since reefs were not a major problem and the Army chose to employ regular landing crafts for invasions. In addition, some work was carried out on systems for making regular tanks amphibious, which were used extensively during D-Day where they suffered high casualties when the heavy seas capsized many of the "swimming tanks." It was not until late in the war that LVTs were used in a number of river crossing operations in Germany and Italy where they achieved some success, notably in the Po River assault in the Spring of 1945. Army use of AMTRACs in the European Theater of Operations was almost insignificant in comparison to their use in the Pacific War.

Numerous LVT-1s and LVT-2s sit in a vehicle park somewhere in England prior to D-Day in early 1944. Unlike the Pacific, U.S. forces in the European Theater did not use AMTRACs for amphibious assaults since most of them were reserved for use in the Pacific. It was not until late in the war that they were used during several river crossings in Germany and Italy. (FMC)



This LVT-4 was fitted with a frame for mats which could be laid over muddy river banks to allow tracked vehicles to move forward without the danger of becoming bogged down. (FMC)

An LVT-2 is unloaded from an M26 "Dragon Wagon" transporter at Roermond, Holland for use in crossing the Maas River. Due to their limited track life, AMTRACs were normally transported to their area of operations rather than moved under their own power in order to insure the longest possible combat track life. (FMC)



Troops of the 9th Army prepare to board LVT-2s and LVT-4s for the Roer River crossing. By this stage of the war, the biggest threat to the AMTRACs were mines which could easily disable or destroy the thinned skinned vehicles. (FMC)

British troops from the Cheshire Regiment form up on the east bank of the Rhine River after a successful crossing of this major waterway on 24 March 1945 in support of the 1st Commando Brigade during the assault on Wesel. This crossing was one of the largest operations involving LVTs during the European campaign. (FMC)

The British modified a number of LVTs with additional armament such as this LVT-4 fitted with a 20MM Polsten cannon in place of the usual .50 caliber machine gun. Other types of armament fitted included flamethrowers and additional machine guns. (FMC)

Men from the 88th Infantry Division load a 105MM howitzer into an LVT-4 in preparation for the Po River crossing in the Spring of 1945. This AMTRAC has been fitted with large box-like shields for its machine guns. (FMC)

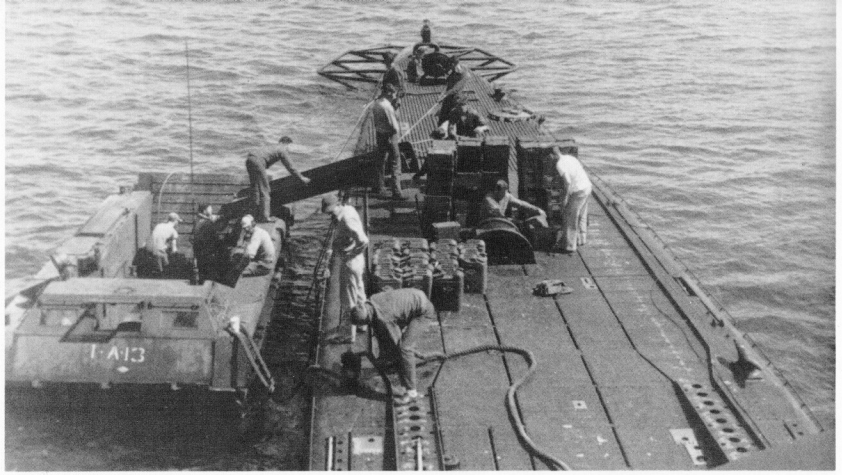
Post War

With the end of the Second World War, the U. S. quickly cut down its military machine in a wave of peacetime euphoria. While the Army scrapped most of its LVTs, the Marine Corps placed a large number in storage. The LVT-3 became its postwar amphibious assault weapon and the LVT-4/5 was retained for fire support. Some modifications were made to these vehicles to improve their effectiveness, but little funding was available for development of new vehicles.

Unfortunately, the hopes for a lasting peace following the end of the Second World War were dashed in June of 1950 when North Korea carried out an unprovoked attack against South Korea. Caught off-guard, American forces were committed peacemeal in the initial phases of the war and were forced back to the southern tip of the Korean peninsula into an area known as the Pusan Perimeter.

While these forces held out, the Marines carried out a surprise amphibious assault against Inchon, far behind the enemy forces, which cut their supply lines. LVT-3s and 3Cs were used extensively during the initial landings and later teamed with LVT-5s during the crossing of the Han River. Later, when the Marines were relifted for an attack against the port of Hungnam, they were forced to wait until the extensive minefields were cleared. Eventually, South Korean forces secured the port and the troops made an unopposed landing.

With the entry of the Chinese into the war, U.S. and Allied forces were forced out of North Korea and carried out a fighting withdrawal to points south of the 38th parallel. As the fighting continued, the front stabilized and eventually nearly two years of static warfare followed. During this period, the Marines were employed as standard infantry and carried out no further large scale amphibious assaults like Inchon. Their LVT-3s were used mainly as armored personnel carriers and supply vehicles, although on occasion they did take part in commando raids along the North Korean coast by American, British and South Korean troops. LVT-5s were employed primarily as self-propelled artillery and were often heavily sandbagged to supplement their thin armor against counter-battery fire.

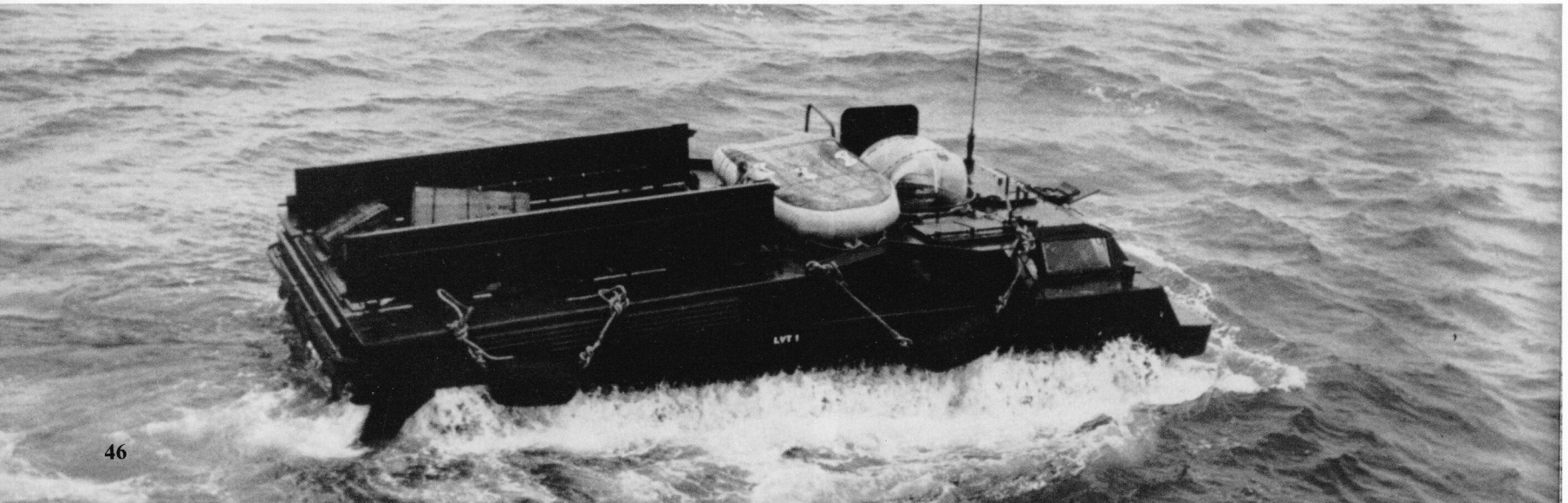


The crew of this LVT-3 takes on fuel and supplies from a sub during an exercise in the Pacific. Tests proved the feasibility of using subs to support amphibious forces but this tactic was never used operationally. (National Archives)

When the Korean War ended in mid-1953, the LVTs that remained in service were in very poor shape. While some were able to be reconditioned, officials realized that these first generation AMTRACs and AMTANKs had reached the effective end of their useful lives. New vehicles under development were in the process of having the bugs worked out of their designs and these would begin coming into service during the mid-1950s. This new generation of LVTs will be the subject of Volume Two of AMTRACs in Action.

in Action.

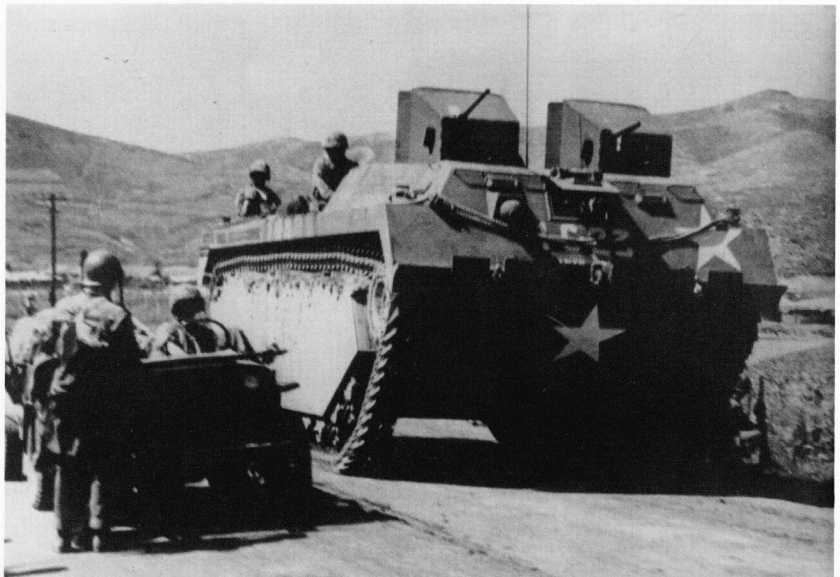
This LVT-3(C) is being used to carry supplies to Wales Field in the Alaskan Islands. In place of the armored gun turret, a clear plexiglass turret from an aircraft has been fitted for better vision and protection against the harsh elements. (National Archives)



Following the North Korean invasion of South Korea, American forces were committed to the fighting under the United Nations. Following a series of reversals, a surprise amphibious assault against the port of Inchon by elements of the 1st Marine Division turned the tide. These Marines in an LVT-3 head for Blue Beach II on 15 September 1950. (USMC)

Seoul, situated on the north side of the Han River, was the main objective of the initial attack. AMTRACs proved invaluable in ferrying troops across the river. This LVT-3 eases into the river in preparation for the crossing. The LVTs helped keep up the momentum of the drive and allowed the North Koreans little chance to regroup. (National Archives)

AMTRACs were used as armored personnel carriers during the drive from Inchon toward the South Korean capital of Seoul. Army troops pause to watch as an LVT-3 passes by them during the advance on the capital. (National Archives)



A Marine LVT(A)-5 provides support for British commandos during a raid on the North Korean coast. These raids kept the communists off-guard and tied up troops which could have been put to more aggressive use further south against UN forces. (National Archives)

After a series of reversals, UN forces were forced to retreat again and in early 1951 they again had to recapture Seoul. This Army LVT(A)-5 provides fire support for assault troops during the recapture of the capital. (National Archives)

A dug-in Marine LVT(A)-5 (Modified) sits in reserve near Kimpo Airfield outside Seoul in the early spring of 1953. The Korean War was to be the final use first generation LVTs by U.S. forces as newer models were just coming off the drawing boards. (USMC)

Marines unload empty shell casings from their dug-in LVT(A)-5 (Modified) during the summer of 1952. The AMTANKs were dug-in to provide fire support for line units of the 1st Marine Division along the 38th Parallel. To provide protection against Communist counter-battery fire, the LVTs have been heavily sandbagged on their upper deck and turret. (USMC)

Foreign Service

Following the Second World War, AMTRACs saw service with a number of nations in various roles. With the outbreak of war between the Nationalists and Communist Chinese following the defeat of Japan, the United States provided a large amount of aid to the Nationalist forces. Included in this aid were LVT-4s and LVT(A)-4s for Nationalist Marines which were used extensively during the bitter civil war. Eventually, the Communists were able to drive the Nationalist to the island of Formosa and seize complete control of the mainland. Some LVTs were captured and used for a short period until maintenance problems and lack of spare parts resulted in their being scrapped. The Nationalists managed to take a few to Formosa in their retreat and received more from U. S. stockpiles. These were later used in some small scale raids, but were never employed in any large scale operations against the Chinese mainland.

The largest postwar use of LVTs (aside from Korea) came in Indochina where French Union Forces used them extensively in the Red River Delta area against the communist Viet Minh forces of Ho Chi Minh. During the late 1940s the United States had given the French little support, feeling that she was involved basically in a colonial war to retake her former territory. However, with the fall of China to the communists and the invasion of South Korea, the U. S. position suddenly changed. In late 1950, supplies of LVT-4s and LVT(A)-4s began to arrive to re-equip French forces. These vehicles, in conjunction with the M29 Weasel supply carrier, gave the French new mobility in the marshy terrain of the delta.

Initially used in small numbers by Foreign Legion cavalry, they gradually grew in numbers and eventually were formed into two amphibious groups. While the LVT(A)-4s were used basically as received, the LVT-4s received numerous modifications to increase their effectiveness. The basic troop carriers were fitted with shields for their machine guns and, in some cases, had recoilless rifles or mortars mounted to provide fire support for their troops. Some were fitted with a 40MM Bofors cannon to provide additional firepower or to supplement the 75MM howitzers of the LVT(A)4s. The French also used their LVTs in a number of amphibious landings along the coast in an attempt to isolate and destroy Viet Minh units. While the use of LVTs did much to enhance mobility for French forces, the communists learned how to counter this new mobility to a certain degree and, as they acquired anti-tank weapons, they were able to take the LVTs under heavy fire. In addition, the LVTs were not designed for prolonged use on land as APCs and tanks which caused a great deal of maintenance problems. In the long run though, the AMTRACs did boost the French war effort and gave them an effective tool against the elusive guerrillas in the swamps and marsh regions of the river deltas.

When the French Indochina War ended in 1954, most of the LVTs were either scrapped or returned to U. S. control. Some were kept for the formation of a Marine Brigade in the Mediterranean at Argew. These were used to form an adhoc amphibious group in 1956 when French forces were employed, along with English and Israeli troops, against Egypt following Nassar's nationalization of the Suez Canal. These LVT-4s and LVT(A)-4s were used against Port Fouad in November to secure the headwaters of the canal. While the combined French and British forces secured the canal zone against only slight resistance from Egyptian forces, international pressure soon forced them to withdraw. This was to be the last major usage of LVTs in combat, since most were now over a decade old and at the end of their mechanical lives. Although a few continued to serve with Nationalist Chinese and South Korean forces into the early 1960s, these were also scrapped after being replaced by newer vehicles.

A number of LVTs were provided to US Allies in the postwar years. The largest user of these vehicles was the French who employed them in Indochina from 1945 until 1954. A group of LVT-4s wait on an embankment during a lull in operations. AMTRACks were grouped together with M29 Weasels to give French forces additional mobility in the marshy areas around Mekong and Red River Deltas. (ECPA)

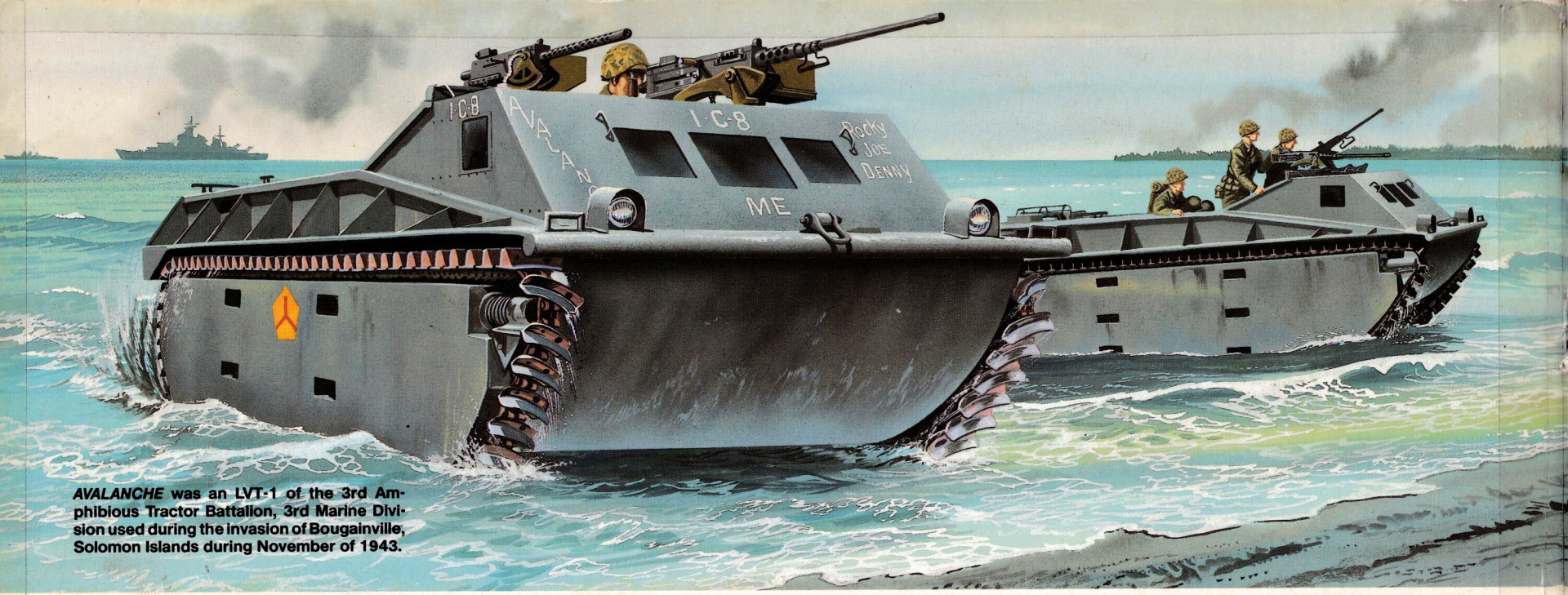
This LVT-4 crew delivers fire support with a 40MM cannon from the top of a dike in the Red River Delta near Hanoi as a section of M29s, nicknamed "Crabs," sits on the lower side of the dike. These specially modified LVTs were used to augment the support platoon made up of LVT(A)-4s. (ECPA)

An LVT(A)-4 awaits the call for fire support during Operation CAMATQUE in the summer of 1953. The AMTANK was from the 7th GEA, 1st GA. The close nature of jungle fighting required that armored vehicles have infantry support. (ECPA)

The LVT(A)-4 was especially vulnerable to close-in attack due to its open topped turret. To provide some protection against enemy grenades and the sun, the crew of this vehicle has rigged a tarp over the fighting compartment. The unit crest is from the 1er REC. (ECPA)

An infantry section stands alongside their LVT-4 in the later stages of the war. It appears that only the crew of the AMTRAC are French. This LVT-4 is from the 1er Rec. The machine guns have been fitted with locally manufactured shields. (ECPA)

The Nationalist Chinese also received a number of LVTs for their Marine Corps. Many of these were decorated on the side pontoons with their Marine Corps insignia which was very similar to the USMC insignia. The small circle above and to the left of the insignia is the Blue and White Nationalist star. (Patton Museum)



AVALANCHE **was an LVT-1 of the 3rd Amphibious Tractor Battalion, 3rd Marine Division used during the invasion of Bougainville, Solomon Islands during November of 1943.**

This LVT(A)-5 modified of the 1st Marine Armored Amphibious Tractor Battalion, was dug into a hillside firing position at Kimpo, Korea during the summer of 1952.

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